VOL. XXIV, NO. 1 JANUARY, 1959

THE TOOL ENGINEER

OFFICIAL PUBLICATION: AMERICAN ASTE SOCIETY OF TOOL ENGINEERS

Departments

Behind every manufactured product is the tool engineer

Now! More picture per dollar!

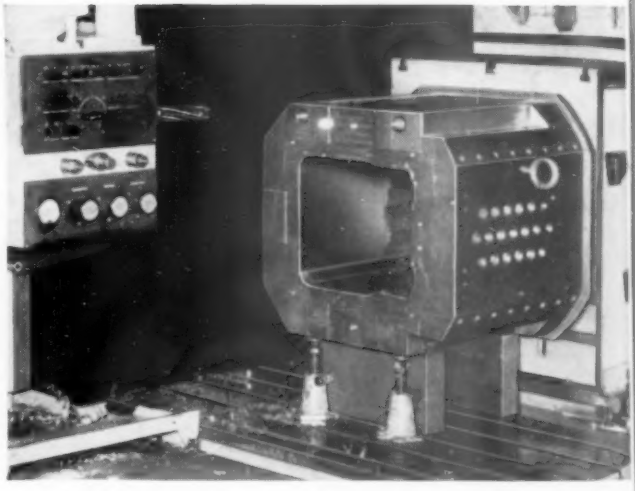
says G.E.

Now! More mold per dollar!

says P&W

Pratt & Whitney *Kellering* translates General Electric's design-ideas into the smart, sturdy cabinets that house their good-looking TV Sets. The intricate plastic molds that form these cabinets are duplicated accurately from models on the type BG-1 Keller Machine pictured above.

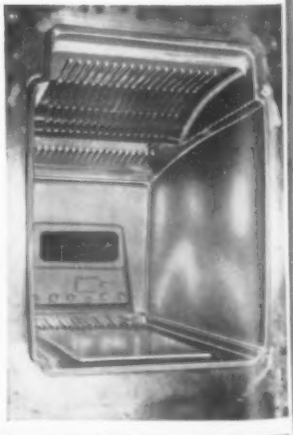
Kellering is heavy-duty, tracer-controlled milling — the most modern, efficient, economical way to accurately and automatically produce dies and molds from wooden or cast models. P&W makes the Keller in all types and sizes for 2-dimensional and 3-dimensional work. It will pay you well to look into *Kellering*. May we send you descriptive Bulletins?

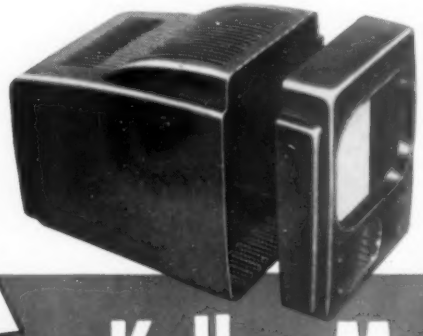


Top: Mold for TV Cabinet set up on the Keller BG-1.

Right: An indication of the precision required by G.E.'s die and mold shop.

Below: Plastic Cabinet for G-E Model 805 TV Set.





Pratt & Whitney

Division Niles-Bement-Pond Company
WEST HARTFORD 1, CONNECTICUT

Keller Machines

The Tool Engineer

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January, 1950

Vol. XXIV No. 1

Editorial

The Path Toward Profits

A RECENTLY-COMPLETED SURVEY of ASTE's membership, which indicated that some eighty percent of those replying planned to buy the same amount or more new equipment than they did in 1948, points up an important fundamental of modern production.

The fundamental is simply that the basis for higher production, at decreased cost with equal or better quality, is the tooling used for the job. Improved tooling, engineered for the particular job or adaptable to a wider number of specific jobs, is the most effective answer to industry's problem of reducing costs.

Lowered production costs depend to a great extent upon worker productivity. This is particularly true in the metalworking fields, where labor represents almost half of the total cost of the product. But productivity cannot be increased simply by speeding up assembly lines or adding to work assignments.

If it were possible to do this, it would not be wise. For the most costly investment in the shop, from the standpoints of original investment (training) and upkeep (wages) is the workman. By utilizing unsuitable or obsolete tooling for production runs and assigning the expensive and fragile workman to supplement this tooling, management is increasing, rather than lowering, costs.

Long ago the very largest manufacturers, accustomed to tremendous production runs, realized the fallacy of this thinking, and relied more and more on better tooling to effectively raise worker productivity.

But the smaller plant, scheduling shorter and perhaps more varied production runs, very often does not appreciate the economics of the situation. It does not realize that the few hours additional time which a highly-skilled worker may spend on a job is the difference between a profit and a loss on that job. It does not consider the more important fact these "few hours" may, in a short time, equal the cost of new tooling and equipment which would contribute to even further savings.

The moral is obvious. Production runs in the millions are not necessary to investigate the possibilities of faster, better, more flexible tooling and equipment. Progressive tool engineering, applied to the thousands of smaller plants concerned with relatively shorter and more varied runs, will result in drastically reduced costs in the very segment of industry where reduced costs are most needed.

R. B. Douglas

President 1949-1950

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—from Design to Production
From airplanes to washing machines, from turret lathes to thermometers, LANDIS threads serve the world. LANDIS Threading Equipment cuts threads, grinds threads and taps threads — it produces threads in mass production, it produces threads for maintenance — one thread or thousands. And LANDIS engineering know-how is ready to help in original design and product development, or to devise special methods and equipment. In short, LANDIS Machines and Men can help on any part of your threading job.
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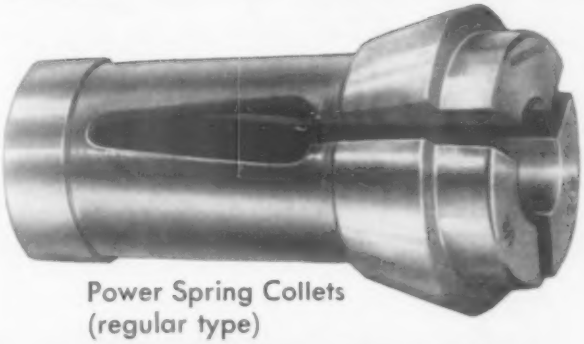
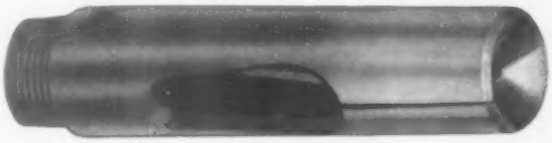
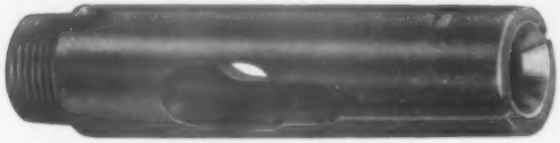


Power Spring Collets
(regular type)

Power Spring Collets
(taper nose type)



Feed Fingers (regular type)



Master Feed Fingers and Pads

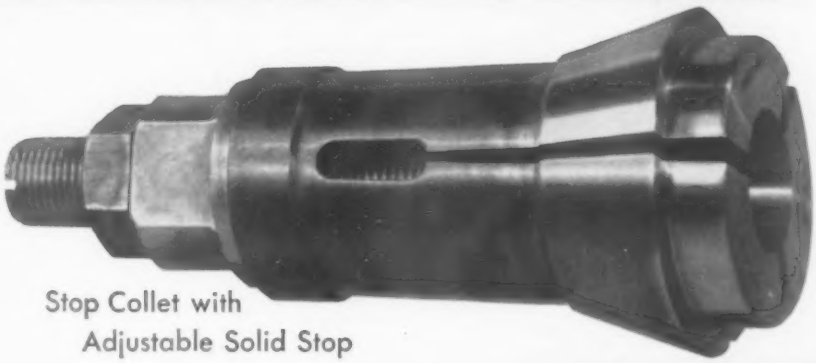
Master Feed Fingers
with Adjustable Tension

HARDINGE
ELMIRA, N.Y.

PRECISION PRODUCTS
for BROWN & SHARPE machines

For maximum production efficiency, specify Hardinge precision products for your Brown & Sharpe Automatics and Wire Feed Screw Machines. Reduce tooling costs and step up production with these and other Hardinge precision products engineered, customer-shop tested, and approved for Brown & Sharpe machines. Write for Catalog 36 — contains complete descriptions, specifications, and ordering information.

Deliveries from stock



Stop Collet with
Adjustable Solid Stop

Stop Collet with
Adjustable Spring Ejector Stop

HARDINGE BROTHERS, INC., ELMIRA, N. Y.
"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

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Faster Tapping

on every job...

WITH THIS COMPLETE MORSE LINE

Yes, Morse Taps cut far faster because they're precision-cut themselves . . . give you smoother, stronger threads without clogging or damage. And that's because Morse takes the time and pains to make taps with a full measure of quality.

Whatever your material and job-conditions, Morse has the right tap for you . . . cut thread or ground thread . . . standard or special. Ask your Morse-Franchised Distributor to recommend the type and size of Morse Taps that will be most effective in speeding up your operation and cutting your costs. *Call him today.*

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Sold Exclusively Through Morse-Franchised Distributors

Accuracy, Quality, Uniformity: the MORSE Code of Cutting-Tool Manufacture

MORSE TWIST DRILL & MACHINE COMPANY

NEW BEDFORD, MASSACHUSETTS

A DIVISION OF VAN NORMAN COMPANY

BRANCH WAREHOUSES: NEW YORK • DETROIT • CHICAGO • SAN FRANCISCO

THEY CAN TAKE IT...and DO!
...and still maintain accuracy

STANDARD *Dial Indicators*

Built to stand the knocks—often unavoidable

NEW - with Years of Service Ahead

REGULAR
AGD SERIES

AGD SPECIFICATIONS THROUGHOUT

Made in 22 models including 4 dial diameters, 7 different graduations. Also 90° models (stem perpendicular to back). Long Range and Long Stem types.

Decimatic
SERIES

AGD SPECIFICATIONS except Range and Marking

For especially fine checking, extra high repeatability and accuracy. Marked in decimals. No whip of hand. 16 models.

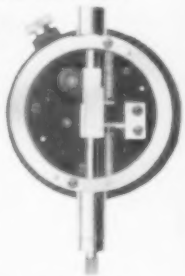
This One Was New...
Years Ago -
Still Serviceable

Obviously it has withstood hard usage, yet indicators such as these are constantly being reconditioned (at a fraction of the original cost) — to return still more dependable service to the owner.

You wouldn't treat your watch the way some indicators have to be treated. Standard Dial Indicators are built to give continuing accuracy while standing the knocks.

Outstanding Reason for the Durability Built into Standard Indicators is the

SHOCKPROOF MECHANISM



Proved by experience to prolong instrument life greatly, Standard's Shockproof Mechanism protects internal parts right from the spindle on. Furnished regularly in most models, not treated as an optional extra. Standard Indicators give longer, trouble-free life, need fewer repairs, are dependable. These facts add up to "Greater Economy."

STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

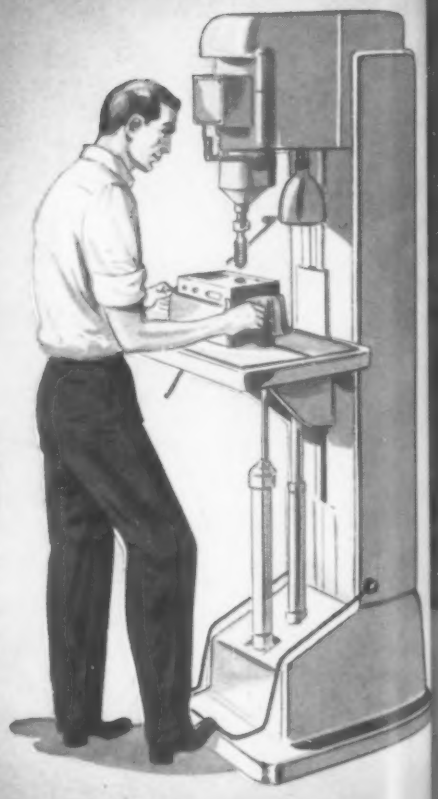
PRECISION·TAPPING WITH WINTER TAPS

Precision tapping is accomplished only under certain conditions. These conditions include accurate tapping machines, perfect alignment, positive lead control, and precision made taps.

Winter Balanced Action Taps meet all requirements for precision, including accuracy of flute spacing, thread dimensions, and chamfers. When other operating conditions are correct Winter Balanced Action Taps will produce precision tapped holes.

Winter engineers are available to help you solve your knotty tapping problems.

Winter supplies all common types of taps and dies as well as taps for special applications.

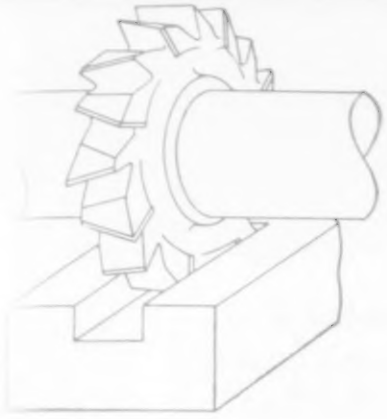


ALWAYS AT YOUR SERVICE

YOUR LOCAL DISTRIBUTOR carries a complete stock of WINTER Taps on his shelves—as close to your tapping problems as the telephone on your desk.

WINTER

WINTER BROTHERS COMPANY • Division of the National Twist Drill and Tool Compan
Rochester, Michigan, U. S. A. Distributors in Principal Cities • Branches in New York, Detroit, Chicago, San Francisc



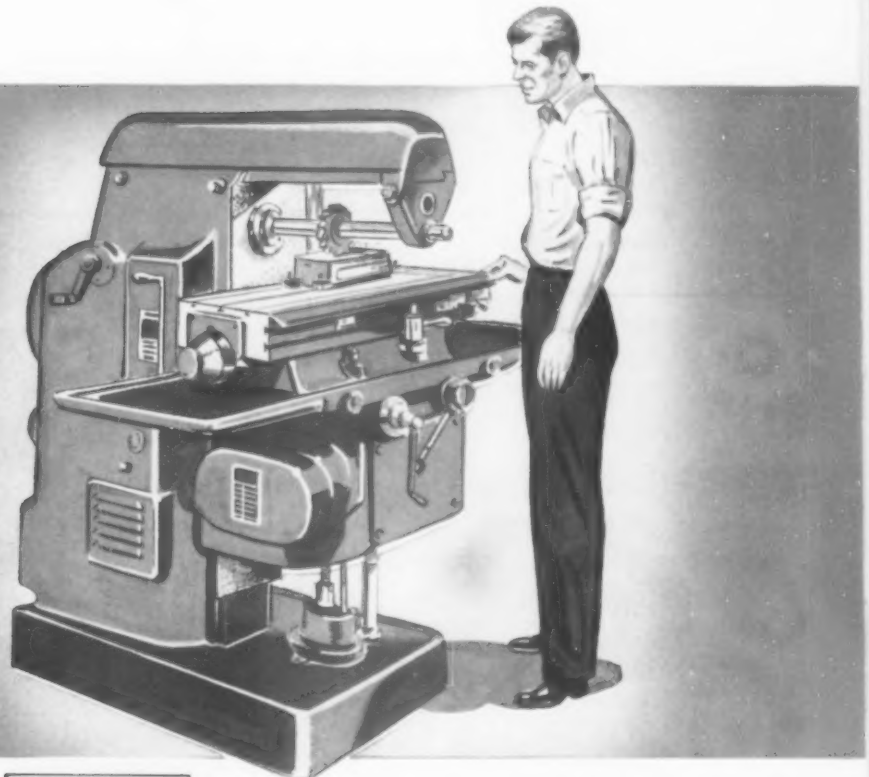
MILLING SLOTS WITH NATIONAL CUTTERS

● The important factors in slot milling are: to maintain size or width, to clear out the chips, and to produce the best finish possible.

Several types of National Milling Cutters and Saws are available for this purpose, each designed for a particular application.

National engineers will assist you in selecting the correct type for your job, and will aid by recommending suitable operating conditions.

National products include twist drills, reamers, counterbores, milling cutters, end mills, hobs, and special tools.



CALL YOUR DISTRIBUTOR

LEADING DISTRIBUTORS EVERYWHERE offer complete stocks of NATIONAL metal cutting tools. Call them for cutting tools or any other staple industrial products.

NATIONAL TWIST DRILL & TOOL ROCHESTER, MICH., U.S.A.

National

NATIONAL TWIST DRILL AND TOOL COMPANY • Rochester, Michigan, U.S.A.

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New Baush 2-Way Horizontal Unit drills, core drills, reams and taps 2 faces of 150 Header Castings, of various sizes, per hour.

SEQUENCE OF OPERATIONS USING 4-STATION TRUNNION TYPE HYDRAULIC INDEX FIXTURE:

1– Load and unload 1 part.

2– Left Head: Core drill holes for ½" pipe thread.
Right Head: Drill Holes for .514" ream.

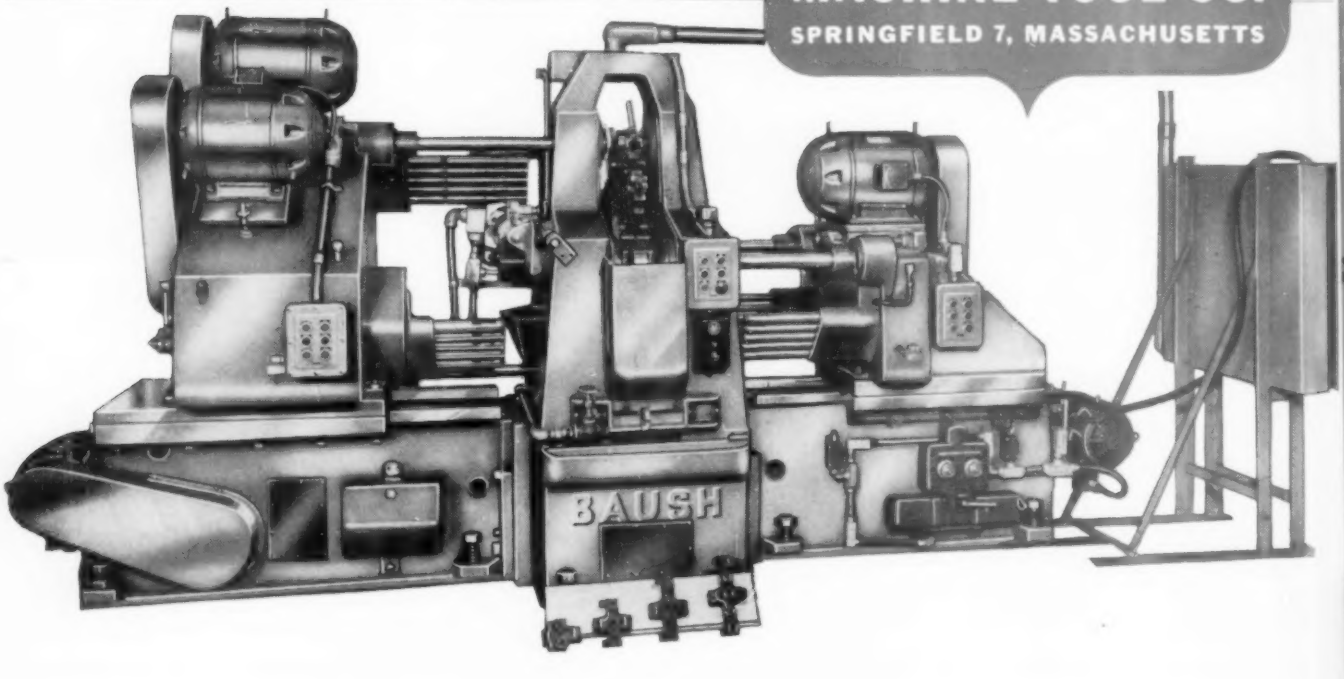
3– Left Head: Idle.
Right Head: Ream .514" diameter holes.

4– Left Head: Tap ½" pipe thread holes.
Right Head: Idle.

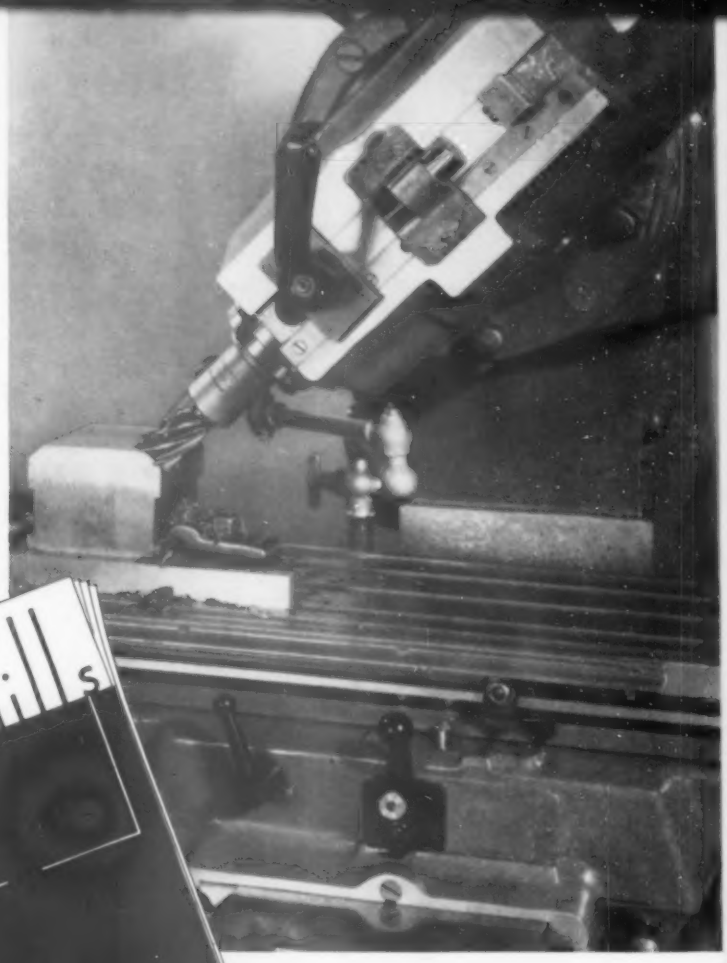
Fixture accommodates 4 sizes of header castings. Part is located from the rough contours of casting which is then clamped by hand. When index pin is positioned for final trunnion location, it interlocks with multiple heads to give automatic machining cycle.

Let Baush Engineers solve your production problems. Phone, wire or write us – Better still, send us your blueprints – we know we can help you.

BAUSH
MACHINE TOOL CO.
SPRINGFIELD 7, MASSACHUSETTS



For more profitable end milling



BROWN & SHARPE OFFERS

quality end mills in styles and sizes to meet every requirement

LATEST ADDITIONS TO THE LINE

Long, Two-Flute Fast Spiral Single-End

Fast Spiral Double-End with 3/16" Straight Shank

Extra Long, Fast Spiral Single-End

Long, Two-Flute Fast Spiral Double-End with 3/16" Straight Shank

Ball End, Two-Flute Fast Spiral Single-End

Long, Fast Spiral Double-End with 3/16" Straight Shank

Two-Flute Fast Spiral Double-End with 3/16" Straight Shank

Long, Fast Spiral Single-End

You can be choosey in the selection of Brown & Sharpe End Mills because there are 18 styles with a complete range of sizes in the line. The closer you match end mills to your needs, the faster, more efficiently they will cut and the less power you'll need for cutting.

Eight recently-added types of end mills are shown at the left. These and all other Brown & Sharpe end mills have design and construction features that will help you improve your milling operations. For example, the fast spiral angle of the teeth of many end mills provides extremely fast cutting action. Also, styles are available for use in the Brown & Sharpe Patented Cam Lock Adapter which provides positive drive and maximum speed and convenience in changing mills.

Get better acquainted with this quality line of end mills. Send for complete catalog containing specifications and prices. Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A.

We urge buying through the Distributor

BROWN & SHARPE CUTTERS B·S

12 BIG REASONS WHY

YOUR BEST BUY is Starrett Satin Chrome MICROMETERS

SATIN CHROME FINISH. Pioneered by Starrett. Now on thimble and sleeve of all micrometers — on the frame of all full finish models. Non-reflecting, eliminates glare, markings stand out sharp and clear, resists rust and stains, increases speed and accuracy.

TAPERED FRAME. Easier to measure in narrow slots and tight places, Standard on all full finish outside micrometers.

HI-MICRO FINISH on contact faces of anvils and spindles for more accurate measurements. This mirror-like finish insures better parallelism of contacts with longer life and less wear.

HARDENED THREADS. Micrometer screw hardened, stabilized and threads ground from the solid for lasting accuracy.

ONE PIECE SPINDLE. Insures long, accurate life.

QUICK READING FIGURES. Every graduation on the thimble numbered for quick, error-proof reading.

DECIMAL EQUIVALENTS of 8ths, 16ths, 32nds and 64ths conveniently marked on frame or thimble.

SLEEVE ADJUSTMENT. Simple adjustment of sleeve maintains Starrett accuracy at all times.

FRICTION THIMBLE. Friction stop mechanism in the thimble "right under your thumb" available if desired. Also available with ratchet stop at end of thimble.

PRECISION BUILT by the World's Greatest Toolmakers.

TYPES FOR EVERY NEED. Sizes from 1" to 168" — all types including tubular frame, black frame, stainless steel, ball anvil, screw thread, crankshaft, sheet metal, tube and paper gage micrometers. Also micrometer heads, inside micrometers and inside micrometer calipers.

EASY TO BUY. Available through Starrett distributors everywhere. The world's leading line of precision micrometers.

For complete information see your Starrett Distributor or write for FREE Starrett Catalog No. 26 "E" and New Satin Chrome Micrometer Folder.

TRADE MARK

Starrett

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Standard of Precision

BUY THROUGH YOUR DISTRIBUTOR

Mechanics' Hand Measuring Tools and Precision Instruments
Dial Indicators • Steel Tapes • Precision Ground Flat Stock
Hacksaws, Band Saws and Band Knives

THE L. S. STARRETT CO. . *World's Greatest Toolmakers* . ATHOL, MASSACHUSETTS . U. S. A.

Savings like these can improve your production picture for 1950

Here are a few typical examples of what Heald engineering has done for others during the past year. Your precision finishing problems are different, of course. But chances are they offer the same opportunities for increasing production, improving product quality and cutting costs with new Heald machines.

Your nearest Heald representative will be glad to show you how to make the coming year a more profitable one.

HEALD

PRECISION INTERNAL AND SURFACE GRINDERS

PRECISION BORE-MATIC FINISHING MACHINES

THE HEALD MACHINE COMPANY

Worcester 6, Mass.

Branch Offices in Chicago • Cleveland • Dayton • Detroit
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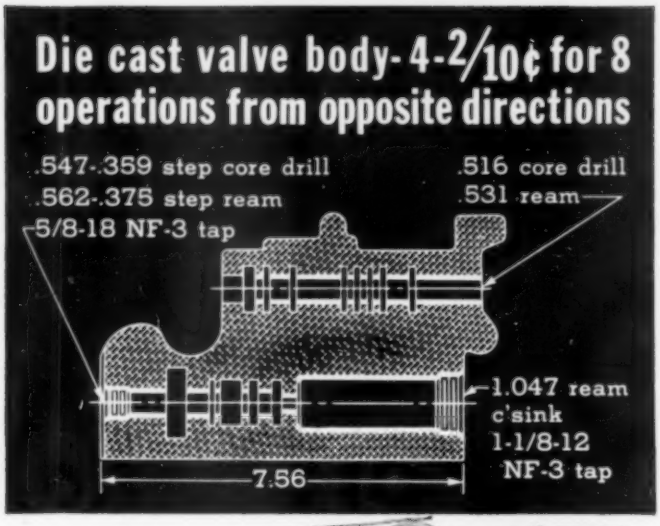
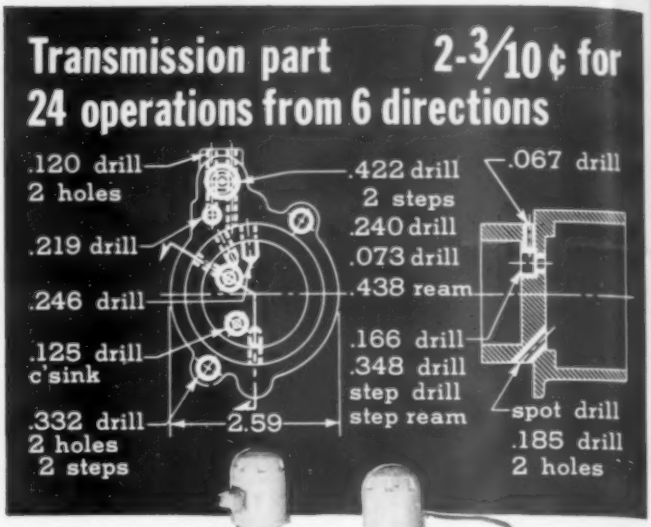
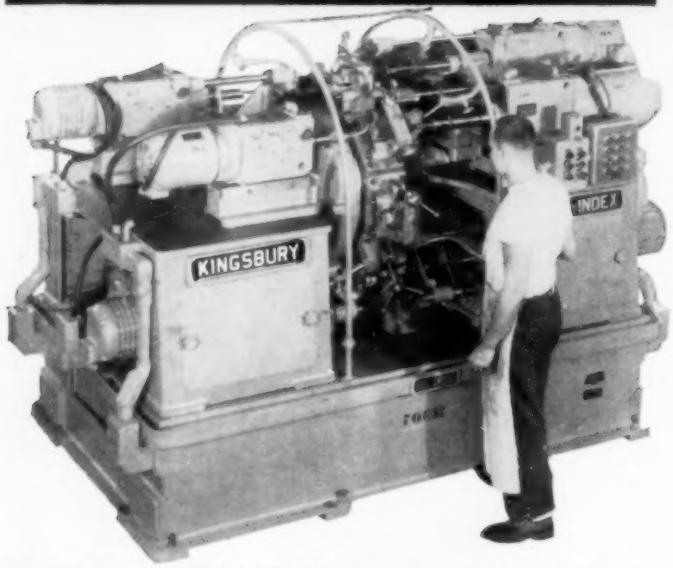
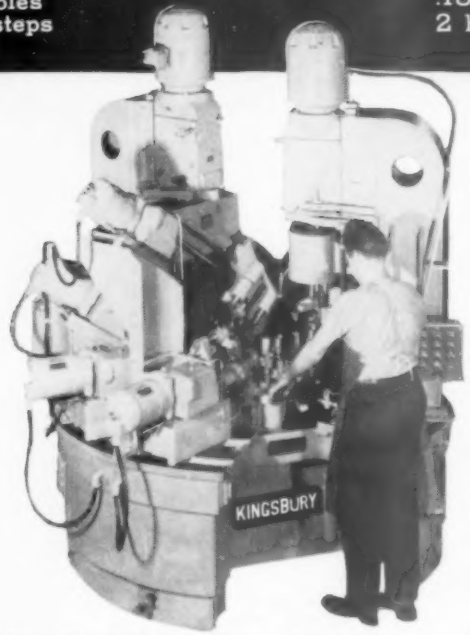






200 PARTS AN HOUR GROSS. Opposed horizontal units on this vertical indexing machine work on opposite faces of the part in the same chucking—three units on the left face and five on the right. Bushings guide all of the tools but the taps.



330 PARTS AN HOUR GROSS. On this horizontal indexing machine ten units work from six directions: vertical, angular, angular across the index table and horizontal—on the radial line and at two angles to it. Bushings guide 15 of the tools.

Costs go down with many

Automatic drilling and tapping machines work from several directions to close tolerances at low cost

Dear Sir:

Look at the number of operations per hour on these parts:

Die cast valve bodies	1280
Transmission parts	6336
Typewriter parts	2688
Throttle bodies	5440

And here are the average costs for man and machine per operation:

Die cast valve bodies	53/100¢
Transmission parts	10/100¢
Typewriter parts	14/100¢
Throttle bodies	19/100¢

We assumed three things: 1) 80% efficiency. 2) Each man's wage rate would equal the national average for such work. 3) The entire cost of each machine and tooling would be paid for after only 6000 hours of operation, a fraction of its useful life. No power or overhead.

You would probably figure these costs another way But you would get the same result: Kingsburys give low unit costs on high production work.

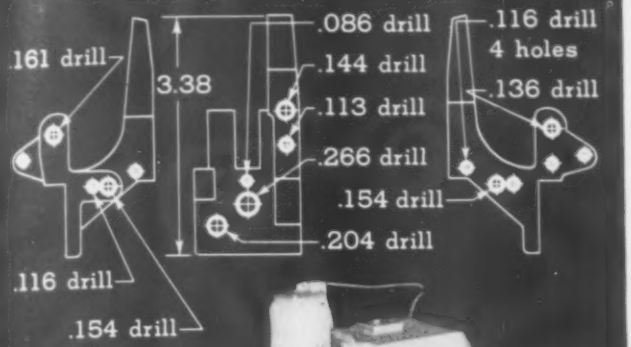
Why unit costs are low

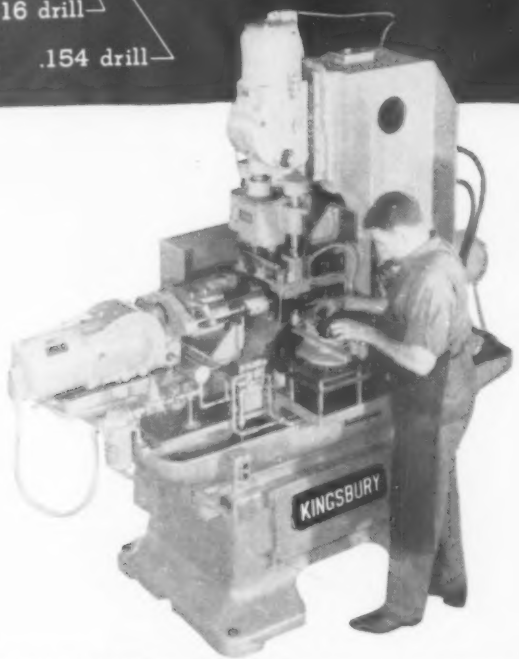
You need several general-purpose machines and several operators to keep up with one Kingsbury and one operator. That costs more, even if your machines would otherwise be idle. You pay for more operators, more supervision, more handling and more space. If your production is high enough to keep a Kingsbury busy most of the time, it would pay for itself in a matter of months.

A visitor argues a point

Somebody once disputed our claim of one person to a machine. He said, "I just saw a line of Kingsburys — big ones with 25 units apiece. All of them needed two chaps. One chap operated it. Another chap had to work full time hauling away chips." We said he exaggerated and stuck to our claim.

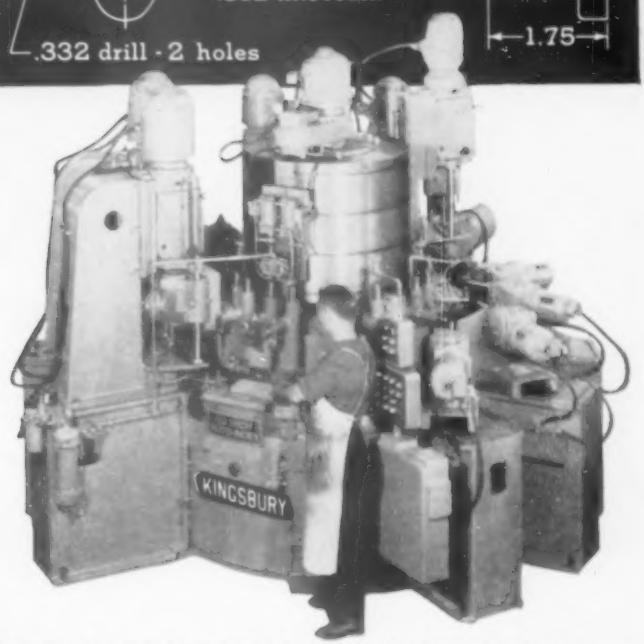
Typewriter part 1-9/10¢ for 14 operations from 3 directions





240 PARTS AN HOUR GROSS. The operator loads two parts in the fixture. Three units drill five holes in one part and nine in the other part. The operator indexes the fixture 180° and the units complete both parts. Bushings guide all 14 of the drills.

Throttle body 3-2/10¢ for 17 operations from 5 directions



400 PARTS AN HOUR GROSS. On this horizontal indexing machine with central column, 13 units work from five directions: vertical, underneath, horizontal, horizontal on the backstroke (milling) and horizontal off radial line. Bushings guide 9 tools.

operations per man-hour

Work from many directions

Each setup above uses a different basic machine. With each type, independent units can operate from different directions in the same chucking of the work. Because we can choose from so many basic machines and units, we can find efficient setups for many jobs.

Close tolerances

Bushings locate tools accurately. Guide bushings are in the fixtures or in plates that pilot to the fixtures. In the four Kingsburys shown, bushings guide 44 of the 63 tools. They do not guide taps, milling cutters or tools that locate from other operations.

Operations are in exact relationship. Each Kingsbury completes many operations in one chucking of the work.

Machining is uniform. Units with automatic cycles and cam feeds perform all operations.

Let's talk about your job

A specific proposal will show you if a Kingsbury can save you money. Just send a print of a high production part to our Mr. L. A. Carll. Tell him the operations and hourly output you need. Or ask him for free bulletins that show 53 setups.

Sincerely,
Kingsbury Machine Tool Corp.
35 Laurel Street, Keene, N. H.

P.S. Don't get the idea we do only *tough* jobs. We can save you money with simple setups too. Just ask us.

KINGSBURY
AUTOMATIC DRILLING & TAPPING MACHINES
for Low-Cost High Production

A NEW WAY TO

From flat stock to → **Vulcan-draw** = *one corner formed*

Vulcan
Designs and Builds
Dies
Tools
Machines
Fixtures
Equipment

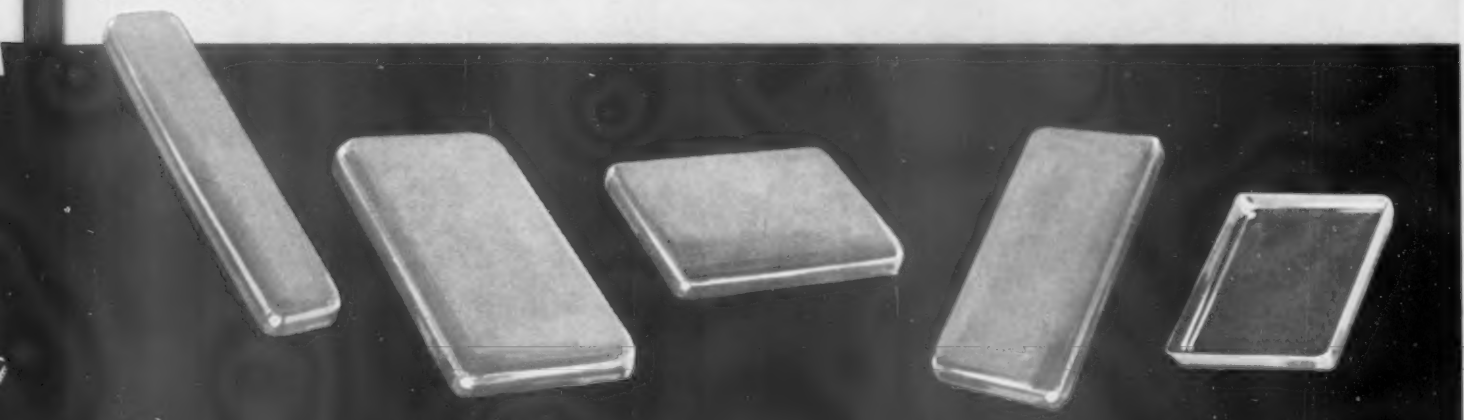
Rotate the sheet forming one corner at a time . . . . overall specified dimensions are held . . .

Vulcan-draw

GUARANTEED! WE'RE TOOL AND DIE BUILDERS SINCE 1916

CUT PANEL COSTS

For medium production schedules you draw one corner at a time...eliminate costly draw dies...eliminate costly notching, hand welding, and finishing...Use simple corner punch and die for all sizes with the same corner radius...switch in a few minutes to a similar die for a corner of different radius.



You further cut costs by releasing punch press equipment for other work. Most any radii and any panel size from 15" x 18" up to the largest panel can be handled in the Vulcan-draw . . . A pedal starts a few-seconds hydraulic cycle producing a corner completely drawn and finish sized . . . Rotate the sheet and you get all corners with overall panel dimensions held . . . Former cost per corner and per finished panel is cut to fractions depending on the number and variety of short or medium run jobs to be done.

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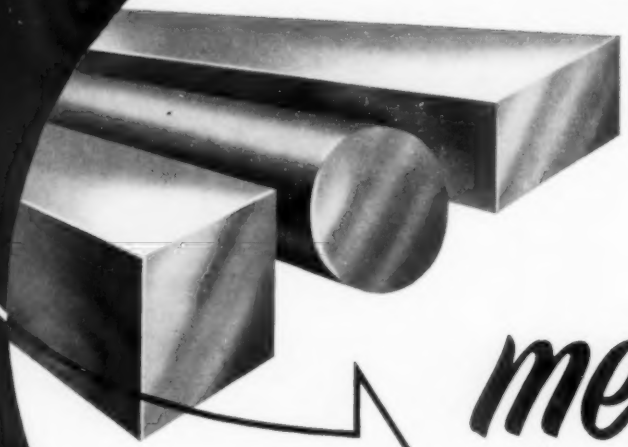

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Development of JIC Industrial Hydraulics Standards

1. The Origin and History of JIC

By R. R. Mitchell

EXECUTIVE SECRETARY, JOINT INDUSTRY CONFERENCE ON HYDRAULICS

THE EVOLUTION OF STANDARDS for various machine components, as well as problems arising over a period of years with hydraulic equipment, led to considerable interest on the part of users for the establishment of industrial hydraulic standards.

Many of our own divisions were concerned over such things as inaccessible location of hydraulic equipment on machines, and in 1947 a number of divisional plant engineers were appointed to a committee to discuss these factors.

Inaccessibility of pumps, valves and piping, they felt, caused excessive downtime for machines, and resulted in increased maintenance time and costs. Some of the conditions reported follow:

1. In one plant, on a large multiple spindle drill with hydraulic feed to the head, the cylinder head packing on the feed cylinder blew out on a Tuesday morning. To install a new packing it was necessary to strip the machine to the column. In addition, some of the parts were so heavy that it was necessary to move the machine from the production line to a location where it could be worked on. The actual repair time to replace the packing was one hour, but it took from Tuesday until Friday morning to assemble and repair the machine.

2. In another plant, a fitting on a hydraulically-operated boring machine sprang a leak. Since the fitting was located under the table, it was necessary to completely dissemble the machine. The machine was out of production for two days, but it required only a half hour to repair the leak.

3. A hydraulic line in another plant burst. Since in this machine a dozen or more pipes are located together, there was considerable difficulty in finding the right pipe. After locating the pipe, it was again necessary to dismantle the machine, and the machine was down for a total of 72 hours.

4. Our attention was drawn to a plant where a battery of 18 hydraulically-operated machines were running. During hot weather these machines would slow down during the day until by the middle of the afternoon production was reduced almost 50 percent. After almost a week of attempting to locate the cause, a representative of the manufacturer was assigned to the job, and succeeded in repairing the difficulty after an additional three days.

5. In a large number of cases after weekend or overnight shutdowns, it is necessary to start hydraulic machines from one to two hours before the regular shift begins work in the morning, in order that the temperature change in the hydraulic system will not affect the accuracy or feed rate of the machine after the shop starts.

Initial activity of the committee was patterned after similar standards applied to electrical equipment. After a time it was decided to invite representatives of the master mechanics' committee to participate in the discussions, and it was then that it was realized that such a standardization program was actually industry-wide. Conferences with other users and with equipment manufacturers resulted at last in the Joint Industry Conferences.

The assistance of representatives of hydraulic equipment manufacturers proved valuable, particularly in enabling each party to understand the problems of the other. Later conferences, as a result, included representatives of manufacturers of presses, welding machines and tubing and fittings.

This leads to one of the most important points in the JIC standards, quoted from the initial paragraph: "The purpose of these standards is to provide detailed specifications for the application of hydraulic equipment wherever used in industry, which will promote a safety of personnel, uninterrupted production, long life of machine, equipment or tool, and will not limit or inhibit advancement in the art of hydraulics."

A series of fourteen Joint Industry Conferences was held, and tentative specifications based on these meetings were prepared and mailed to members for study. In September, 1948, a conference was held to formally approve the standards as suggested, and the approved version was ordered published.

These standards must, of course, be reviewed from time to time in keeping with progressive policy. Through a medium such as JIC the hydraulic equipment manufacturer as well as the industrial equipment builder can be kept informed of the customers' wants and needs.

An impressive example of the progress in adapting users' needs to improved machine designs lies in the fact that some of the recommendations, discussed in conferences less than a year ago, are incorporated in machines now in use and being built.

The importance of hydraulic standards to the user and to the equipment builder cannot be over-emphasized. One need only contrast the electrification of machine tools of former years with that of present machines to realize the extent to which cooperatively established standards are promoting safety of personnel, uninterrupted production, long equipment life and reduced maintenance. General acceptance of the hydraulic standards throughout industry will make it possible for the industrial equipment builder to handle the application of equipment on a production basis and thus eliminate the delay, expense and confusion which inevitably result from attempts to follow special instructions.

From papers presented before the Detroit chapter, ASTE, September 8, 1949.

2—How JIC Standards Benefit the User

By Don P. Morrell
SUPERVISOR
STANDARDS & CONTROL APPLICATIONS, PRODUCTION ENGINEERING
FORD MOTOR COMPANY

In discussing the JIC program and its benefits to the user, the point should be stressed that the Joint Industry Conference Standards are minimum performance standards, not dimensional design standards, and as such put no limitation on good design or development.

The various figures in this article illustrate problems that are of deep concern to the users of high production industrial equipment. These problems can be corrected by use of JIC standards.

The basic reason for our deep concern can be said in three words, "excessive production downtime." The underlying causes for excessive hydraulic downtime include:

Insufficient protection from dirt.
Inaccessibility of hydraulic components.
Poor piping installations.
Functionally incorrect circuit engineering.
Insufficient dissemination of maintenance information by industrial equipment builder.
Laxity on the part of the user in setting up comprehensive preventive maintenance procedures.

Fig. 1 is a view through the access opening of a production lathe used to rough-out bearing surfaces on the 8-cylinder crankshaft. The tubing (arrow) is copper and is not supported, and the electrical conduit runs helter-skelter around piping and valving. All hydraulic components seen in Fig. 1 are enclosed by a large cover. Another large cover encloses the pump and motor on the opposite side of the machine.

To make repairs on this machine the covers must first be removed with the help of a chain fall. This requires at least one hour. To replace any of the directional valves (barred arrow), requires an additional two to three hours.

The machine gear boxes in this machine are lubricated by the hydraulic system oil, which results in excessive contamination of the hydraulic oils by oxidation and foreign particles. Hence frequent shutdowns for oil change are required. To clean the oil reservoir it is necessary to disconnect the electric motor, uncouple the pump, remove reservoir cover bolts, lift assembly by means of a chain fall, clean reservoir and then reassemble. Elapsed time, six hours.

If we assume that this machine were rebuilt to conform to the Joint Industry Conference standards, the following construction advantages would then be incorporated:

1. Sealed reservoir with adequate accessible provisions for clean-out. (Clean-out time, thirty minutes).

2. Hydraulic and lubrication systems would be separate. This would reduce considerably contamination of the hydraulic system and in addition reduce frequency of shutdowns for clean-out-purposes.

3. The pump and control valves would be located for ease of accessibility and probably would be sub-plate mounted and manifolded. A valve could be replaced in twenty minutes.

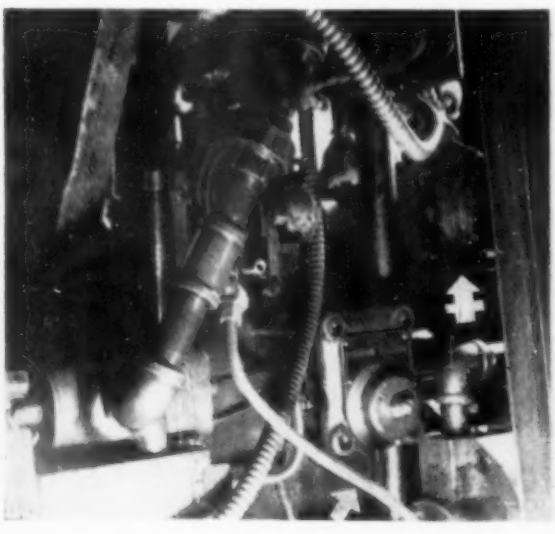


Fig. 1. View through the access opening of a production lathe. Note disorder of arrangement, lack of support.

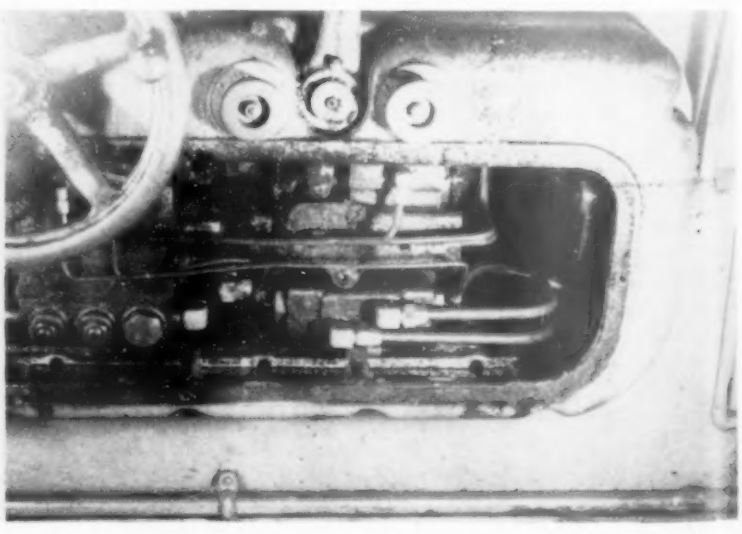


Fig. 2. Reservoirs and controls of a pin grinder are shown here. Control valves are inaccessible; reservoir is not sealed.

Fig. 3. Scored cylinder guard above is on pre-JIC machine.

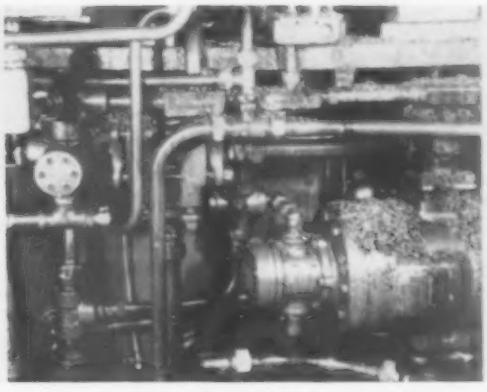


Fig. 4. Lack of protection from chips and dirt is prominent in this example of a pre-JIC machine.

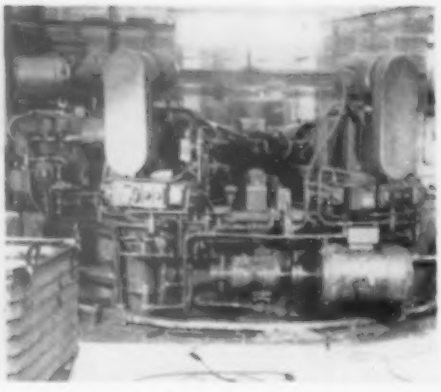


Fig. 5. Another illustration of unplanned piping is seen in the above automatic.

A front view is shown in Fig. 2 of the reservoir and controls of a pin grinder used for grinding the connecting rod bearing. The control valves on the machine are inside the reservoir and inaccessible for maintenance. The oil in the reservoir is only five inches deep, and this causes frequent aeration of the oil which in turn results in erratic feeds. The machine base is not oil-tight, and oil leaks through the reservoir casting. A fact of even greater importance in the construction of the reservoir is that it is not sealed. Grinding dust and tool coolant enter the reservoir, and frequent pump and control valve failures result.

Figs. 3 and 4 illustrate a few examples of hydraulically-actuated machine tools constructed prior to the publication of the Joint Industry Conference Standards for Hydraulic Equipment. Note the scored cylinder guard, inaccessible controls, unsupported tubing and lack of protection from chips and other particles. Note particularly the large amount of chips adjacent to the cylinder in Fig. 3.

Figs. 5, 6 and 7 are what I consider to be good examples of pre-standards and post-standards equipment. Fig. 5 illustrates a machine which drills, reams and taps an automotive rear axle ring gear. Note the general unplanned maze of piping and inaccessible hydraulic equipment. The reservoir is incorporated in the machine base and it is actually necessary to remove some of the piping and hydraulic equipment to remove reservoir clean-out doors.

Due to improper hydraulic and electrical interlock, the machine clamped and indexed out of sequence, which resulted in the machine operator losing a finger. This condition was of course immediately corrected when referred to engineering.

A machine which performs the same functions as the machine shown in Fig. 5 and built by the same manufacturer, is illustrated in Fig. 6. The essential difference is that this machine has been built to JIC standards. The machine is better for what does not show rather than for what is shown:

Note the complete absence of hydraulic piping, and the fact that the machine is manifolded. The hydraulic controls are located behind an easily-removed enclosure.

A closeup of one of the drilling heads is shown in Fig. 7, with the hydraulic enclosure removed. Note that just by the removal of four sockethead cap screws the directional valve can be removed and easily replaced.

Figs. 5 and 7 are excellent illustrations of how the Joint Industry Standards will reduce production downtime. The directional valve described in Fig. 7 can be replaced in less than fifteen minutes; a similar valve on the machine shown in Fig. 5 could not be replaced in less than five hours.

The evolution of one manufacturer's products from "before-standards" to "after-standards" is presented in Figs. 8 and 9. Fig. 8 is a piping and valving view of a machine to counterbore valve seats in the 8-cylinder engine block. Note the front connected valves with inaccessible piping, electrical solenoids and wiring not protected, pumps mounted in reservoir and not visible or accessible.

By looking closely at Fig. 8 it can be seen that the sequence valve (arrow) is supported only by pipe. The support is not adequate, and results in leaking at the connection. Laboratory tests show that almost all commercially-obtainable fittings will tolerate normal hydraulic surges and machine vibration when the hydraulic components are securely mounted and properly supported.

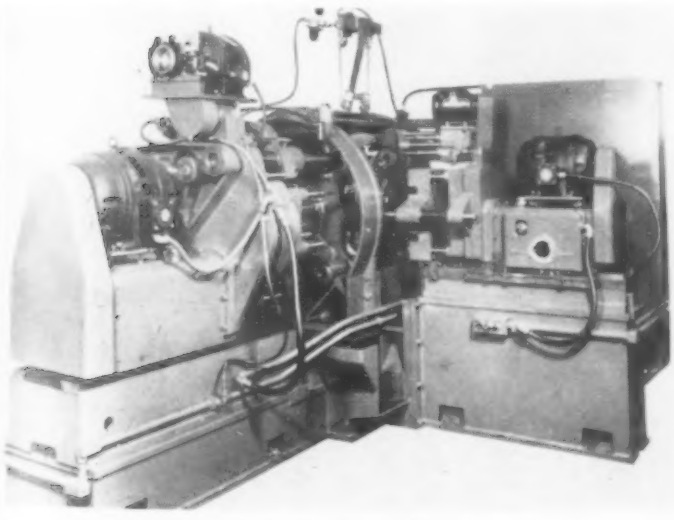


Fig. 6. This drilling, reaming and tapping machine performs the same functions as that shown in Fig. 5; it was built to JIC standards.

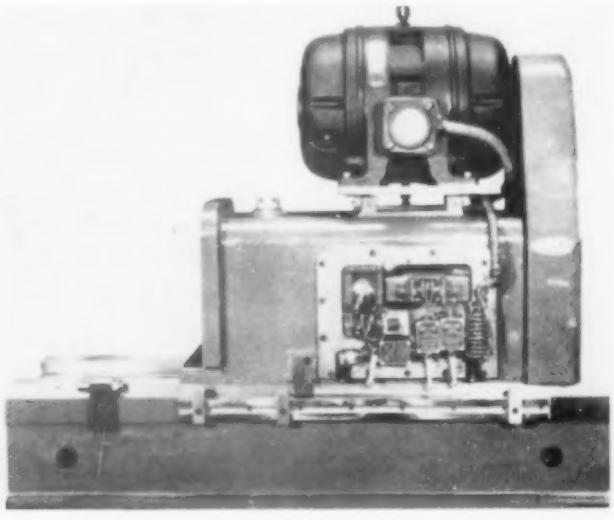


Fig. 7 illustrates a drillhead, with the hydraulic enclosure removed, from the machine shown in Fig. 6.

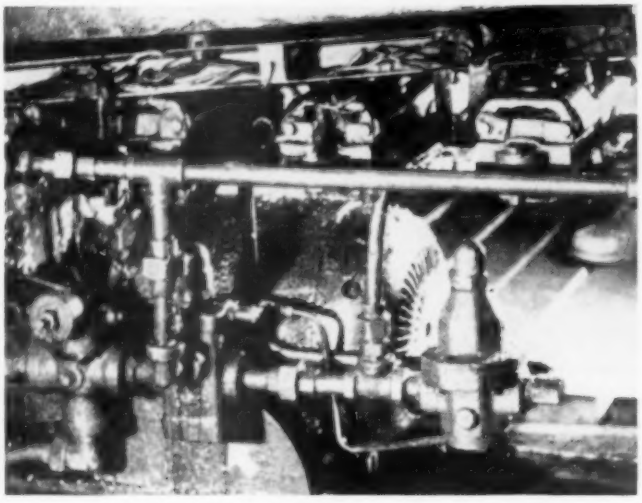


Fig. 8. Above is a machine to counterbore valve seats. Note unprotected wiring; inaccessible piping and controls.

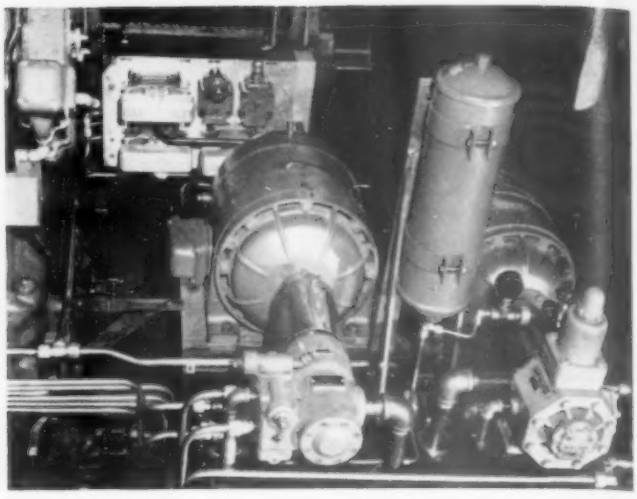


Fig. 9. This is the same machine shown in Fig. 8, after having been rebuilt to conform to JIC standards.

The same machine, after having been rebuilt to conform to the JIC Hydraulic Standards, is shown in Fig. 9. Some of the improvements include:

Hydraulic reservoir is sealed and is separate from machine base.

Pumps have been removed from inside the reservoir and mounted on reservoir cover where they are accessible.

Control valves are sub-plate mounted to manifolds, readily accessible for maintenance, with reduction in piping.

A clarifying type of filter was added to the system which keeps the oil continuously clean, free of deleterious solids and removes corrosive acids as they form.

Functionally the hydraulic circuit was improved by the elimination of one electric motor through using a double pump in place of two single pumps on the counterboring portion of the system. The fixture and clamping portion of the circuit has been improved by the use of a pressure-compensated variable-capacity pump which automatically supplies pressure and volume in accordance with system demands. This of course reduces horsepower loss and excessive heat.

Figs. 10 and 11 illustrate what one broaching machine manufacturer has done in building his equipment to conform to the JIC Standards. Fig. 10 is the rear view of a 10-ton single-ram broach. Note the water cooler which is necessary to keep the oil at a reasonable operating temperature. Most of the hydraulic valves are not visible and are also inaccessible. The hydraulic pump, which is not visible, is mounted inside the reservoir to the underside of the reservoir cover.

The need for conformity to the JIC Standards is best stressed by referring to maintenance records for the time and effort required to change a malfunctioning pump on a machine of this type. To remove and replace the hydraulic pump, the procedure is as follows: Remove all piping and valving in machine column. Disconnect wiring from 30 hp motor. Lift 30 hp motor up machine column by means of crane. Remove reservoir cover and pump. Clean reservoir. Remove pump from reservoir and replace with new pump. Fill reservoir with clean oil, and reverse procedure for reassembly.

The records also showed that to replace one pump the

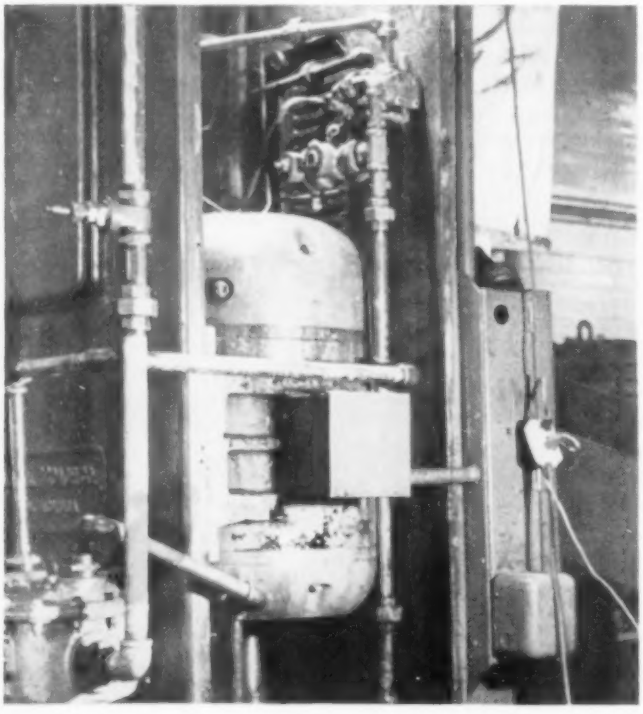


Fig. 10 is a pre-JIC view of a broaching machine. Note water cooler, necessary to keep oil at reasonable operating temperature.

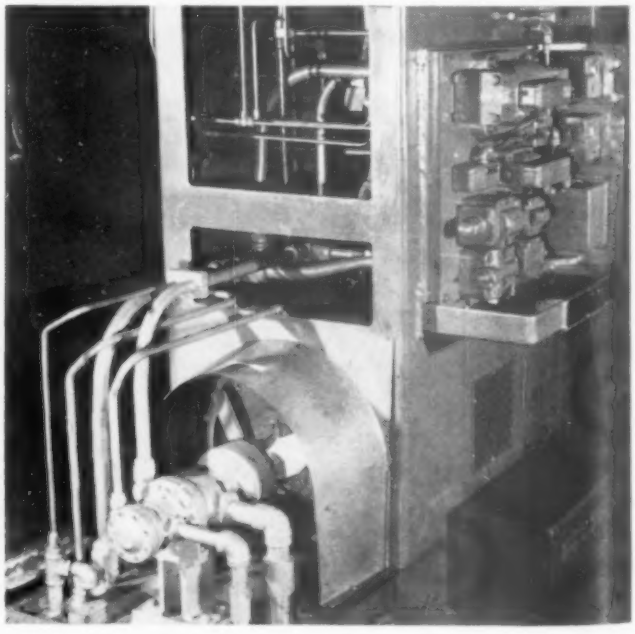


Fig. 11 is a similar view of the same machine redesigned by the manufacturer to JIC standards. Note difference in pump mounting.

services of the following personnel were required:

One 2nd shift and one 1st shift electrician.

Two 2nd shift and two 3rd shift hydraulic journeymen.

Two 2nd shift and two 3rd shift millwrights.

One 2nd shift and one 3rd shift crane operator.

Total production downtime was slightly over two full shifts.

A rear view of the new model of the same machine, built to the JIC Standards by the same manufacturer, is illustrated in Fig. 11. Notice the many improvements, such as the subplate mounted hydraulic valves, and the readily accessible, well-supported hydraulic piping. For photographic purposes the protective enclosures were removed from the piping and the hydraulic panel. Note particularly the difference between the mounting of the pump and motor in Figs. 10 and 11. The services of only one man, the hydraulic journeyman, is required to change a malfunctioning pump.

With Figs. 12 and 13 I would like to show the differences between the usual hydraulic circuit diagram, and a diagram in conformity with the JIC Standards symbols.

Unless the reader is familiar with the flow characteristics of each hydraulic component, it would be quite difficult to determine circuit function from the diagram in Fig. 12.

Some of the features of the JIC-type diagram that are of great assistance to the engineer and the maintenance man follow: All hydraulic components are shown in symbolic form, which permits easy tracing of flow paths. All operating pressures are shown. Cylinder bore sizes, rod sizes and length of strokes are given. Reservoir capacity and pump deliveries are indicated. Piping sizes are shown. Complete catalog information of hydraulic components is given. Operating characteristics of related electrical equipment are also shown. Complete sequence of machine operation in text form is given.

If we, as users, wish to obtain the full advantages of hydraulically-operated industrial equipment, it is essential that complete engineering services be available to all concerned, the maintenance man be fully trained in the care of the equipment, and that adequate preventive maintenance procedures be set up and rigidly followed.

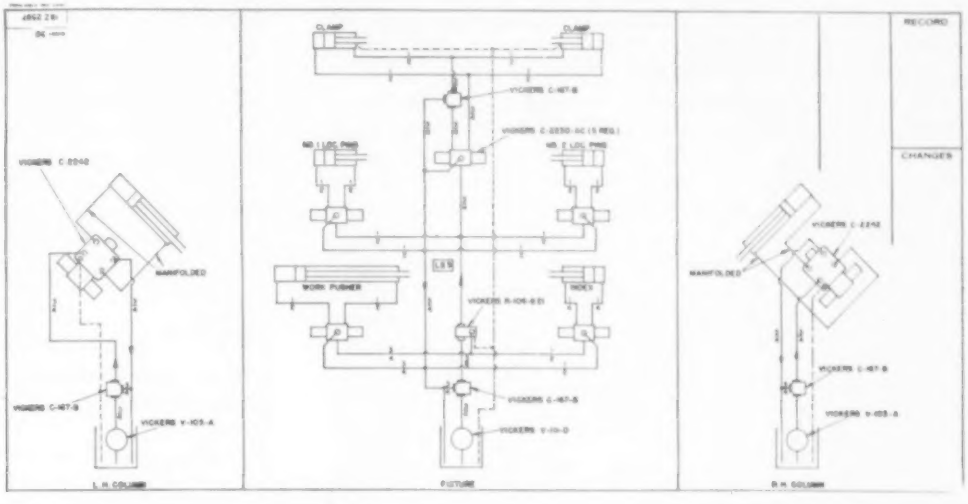
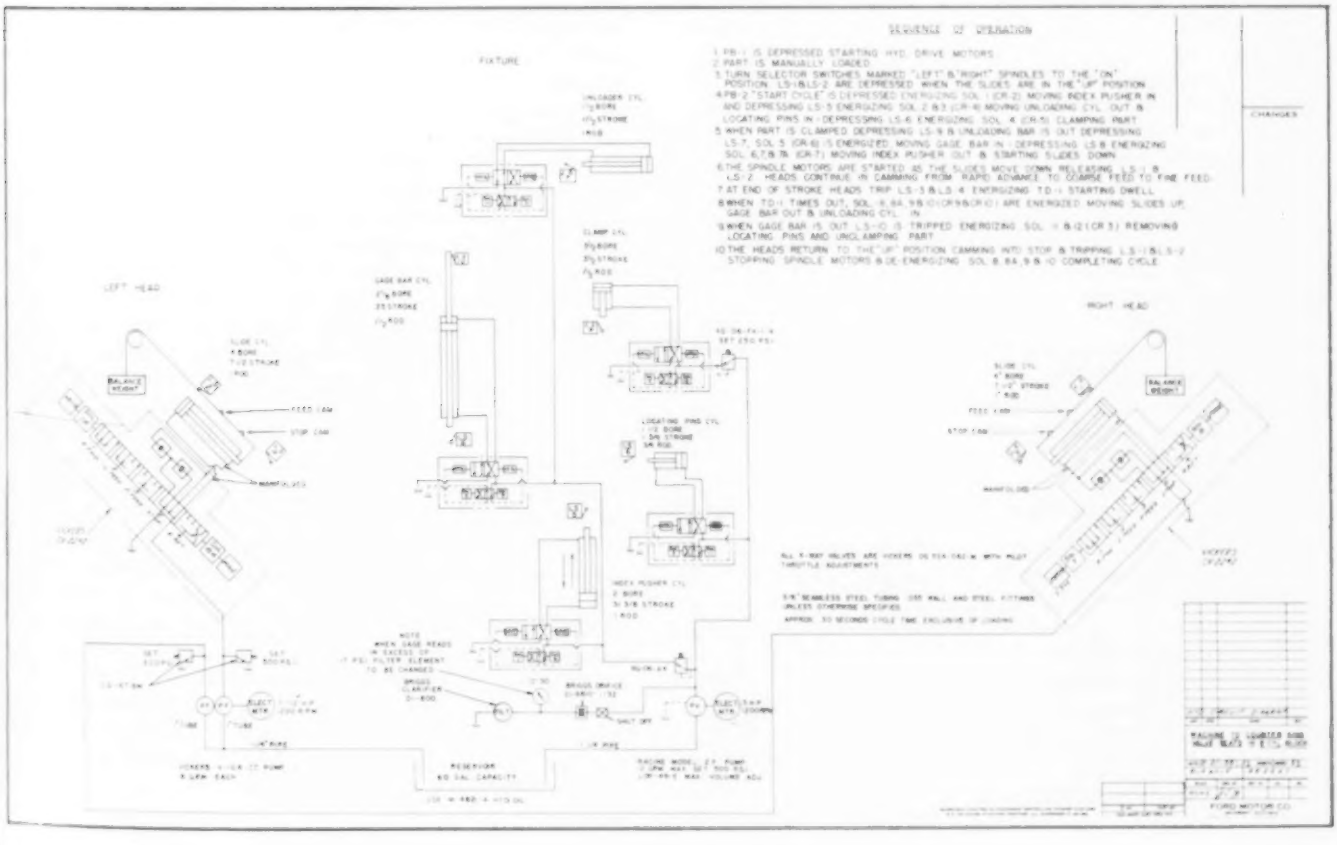


Fig. 12 (right) is a hydraulic circuit diagram drawn to JIC standards. The contrast is considerable when compared to the usual circuit diagram in Fig. 13 (below), which offers not a little difficulty unless the reader is familiar with the flow characteristics of each hydraulic component.



3. The Machine Tool Builder and JIC

By James Robinson

CHIEF ENGINEER, VICKERS, INC.

WHEN THE MOST COMPLICATED hydraulic circuit is analyzed, there are three things which constitute its basis. They consist of : (1) controlling the volume of fluid in order to obtain the desired speed; (2) controlling the pressure of the fluid which dictates force or torque; and (3) controlling the direction of the fluid. Provided these three simple functions are accomplished in the proper manner, every hydraulic circuit should be satisfactory.

All hydraulic equipment used in industry is expected to stand up in service on the same basis as the machine it drives or controls. Generally speaking, it is able to do so. The most prevalent reason for failure to perform as expected is foreign matter in the fluid and the resulting damage done to accurately machined parts. This causes either excessive leakage or complete seizure of rubbing parts. One other common cause of failure, no doubt, is overloading. Many times this is brought about by the expedient of utilizing available equipment to handle the application regardless of rating or sometimes by lack of knowledge of the extreme loads encountered. Nevertheless, it is feasible and practical to design high performance hydraulic units with the desired machine tool life.

Almost two years ago it was my privilege to be appointed chairman of a committee formed by the National Machine Tool Builders' Association, to cooperate with an automotive Joint Industry Committee originated in Detroit by the automobile manufacturers. Manufacturers of other types of equipment were later invited, and also participated.

The purpose of these standards as stated therein, is to provide detailed specifications for the application of hydraulics to industrial equipment. Where new developments in hydraulics will perform in a manner at least equal to these specifications, these new developments will be considered an equivalent. The main thought in the writing of these standards was to promote safety of personnel, obtain as uninterrupted production as possible, and have reasonable assurance of good life expectancy. It is expected that the standards, even if accepted only by the automotive group, will apply to equipment other than machine tools, and for this reason they are proposed to cover hydraulic equipment in general applications.

Performance Specifications

It is necessary for the machine builder to submit performance specifications on hydraulic equipment. This does not mean that laboratory tests or even production test figures are necessary with each item. It is felt that the submission of standard sales literature describing functional characteristics and general performance data is sufficient.

One important provision of the standards is that hydraulic and lubricating systems shall be separated. Undoubtedly this would create great hardship and handicap on many types of machines, but exceptions are given and they can be combined under the following provisions: First, that hydraulic fluid must not be used to lubricate ways, slides, or any exposed surface. It is possible in this respect to argue that technically a piston rod, which would be an exposed surface when leaving the cylinder construction, should not be lubricated with hydraulic fluid, but I am sure no arguments will arise, as the intent of the statement was primarily for ways and slides. In the second case, combinations utilizing a lubricating system as a means of operating a mechanism hydraulically are also permissible, but only if unit pressure is low, operation is infrequent, or of an auxiliary nature. This would apply to machines such as some centerless grinders where a small hydraulic actuation is used to position the wheel. In the third case, and this is probably the most important, means must be provided to remove any contamination that would affect either the lubricating or the hydraulic system.

Fluid Temperature

Since most hydraulic oils are subject to breakdown, especially with heat, it is stated that the temperature of the fluid shall not exceed 130 deg F. It should be noted that this is a pump inlet temperature only, or it could be construed to be the temperature of the oil reservoir, provided the pump is drawing from it. Knowing that hot spots are prevalent, due to the necessary use of relief valves or orifices, a temperature at these spots of 250 deg F is permissible.

The calling for a pressure-time diagram to be taken under operating conditions was a point that was argued against as being impractical, especially in large machines where equipment would have to be made available by the purchaser, but this objection was eliminated by the additional statement that this type of diagram would be furnished only when specified on the purchase order.

While, as stated before, new developments in hydraulics are acceptable provided their performance is satisfactory, it is stated that hydraulic equipment shall be of proven engineering design. This would seem to dictate that what we are now using in the line of hydraulics was relatively frozen, but as I interpret this particular section, it would prohibit only the installation of experimental hydraulic equipment on machine tools until such time as the manufacturer had definite proof that it would be successful.

Diagrams and symbols of equipment have been simplified, and a simple symbolic diagram should be sufficient to convey necessary information to the purchases. All other types of diagrams, whether they be portrayed in multicolors or show cross-sectional views or a combination of both, are not required unless a specific request is contained in the purchase order. All of these items which formerly read, "when requested by purchaser" have throughout the entire standards been changed to, "when requested on purchase order." This, from our point of view, was a very important and worthwhile change, as being on the purchase order, it

could be expected to be a separate chargeable item, whereas if merely requested by the purchaser in the form of a letter or verbally, it might have been difficult to include it with the cost of the machine.

The safety of personnel is a must in all power machinery. Unfortunately, in the past this safety feature has too often been ignored. Fluid hydraulics in themselves are inherently safe, except possible damage that might be caused by the bursting of pipes. This damage is seldom dangerous to personnel. When fluid hydraulics are combined with some other power source, such as an accumulator, danger often is not so controllable. In cases where direct high-pressure air is used as an accumulator directly in contact with oil, explosions have been known to occur, and even with other types of stored energy, circuits can operate even though the prime mover of the machine is off.

Oil Leakage

One of the goals of every machine tool builder and user is to provide for uninterrupted production. A simple thing such as oil leakage has often been the cause of a production shut-down; therefore, oil leakage was specifically dealt with to the extent that, to quote from another paragraph, "There shall be no evidence of external leakage."

The next pertinent point is the long life of the equipment. It is often argued that proper maintenance is the major factor in assuring long machine tool life. The maintenance problem is of major importance today, and it should be pointed out that too often untrained personnel are doing needed maintenance work. Should not users have men trained in hydraulic maintenance similar to electricians and these men *only* permitted to maintain hydraulic machines?

Under the section dealing with controls it is stated that all pressure controls shall be so constructed as not to be adjustable outside their normal working ranges and shall be marked to indicate nominal minimum and maximum pressures.

The intent of this paragraph is not necessarily an attempt to make the relief valve suitable for the particular machine on which it is used, but to make the relief valve fool-proof in itself within its own capacity. The fact that a relief valve might be capable of operating from, say, 200 to 1500 psi, and be so marked, would not reduce a hazard that might be present if the machine builder required a maximum of, say, 1200 psi. The objective in this case would be to allow the user of the machine to replace a damaged relief valve with one having the same rating as was used without the dangerous consequences of installing a new one which would be capable of being set at perhaps twice or three times the maximum pressure of the original one.

It is only natural for the user of a machine to want all hydraulic controls in an accessible position. It was originally dictated that they would all be two or more feet above the floor. From the users' point of view, this positioning was very desirable for maintenance and accessibility, but in many cases such positioning might prohibit the proper functioning of the circuit. Wording to this effect is now used in the specifications, and also a note added to the effect that this particular paragraph is written as a guide for all new designs. Deviations would be as agreed between the supplier and purchaser.

The subject of fittings and tubing, while seemingly of relatively minor importance to a machine builder, has been the cause of many arguments in the discussions. One question raised, for example, was "Can Bundy tubing be used?" Actually there is nothing in the specifications that prohibits the used of Bundy tubing, as they state, "S.A.E. 1010 dead soft, cold drawn seamless steel or *equivalent* tubing shall be used." Naturally, if Bundy tubing were used (independent of the pressure), it would be satisfactory as an equivalent provided it was able to comply with the other parts of the specification, such as, "The strength of the piping shall be adequate," etc.

In dealing with heat exchangers, it was found that one type commonly used in hydraulic circuits is manufactured by copper hydrogen brazing, and in order to allow their continued use, the sentence dealing with them states that they are permissible except when uninhibited petroleum base fluids are used. This concession might cause some arguments, as no similar concessions were made on the use of copper tubing. It was felt, however, that heat exchangers of this type form a very small percentage of the surface contact on a small percentage of machines.

Regarding fittings, there is no standard fitting actually called for. Any make of fitting is suitable provided it meets the performance requirements dictated. There is one exception, and that is that soldered connections are not permissible. Argument arose against soldered connections because of the cold flow that occurs when soft, common solder is used. The other argument was directed against the soldering of tubing or piping directly into hydraulic components without the use of removable flanges. This restriction to soldered connections should not apply to what is commonly referred to as "silver soldering," as this is actually a silver brazing condition which should be permissible. In the interests of attempting to standardize on flaring rods, it was decided, and is so written, that the angle of flare shall be 74 deg, but only on fittings which require a flaring tool. This would not apply to many fittings which are self-flaring or seal themselves in the operation of assembling.

Originally, when surge pressures were being discussed, some JIC members had become familiar with pressure pick-ups of the electronics type. These have been well-known to the machine tool industry for many years, but since they were unfamiliar to some of the users, a clause was added which dictate that surge measuring devices must be capable of measuring surges of 0.001 second duration. Most of the large automobile manufacturers are studying means of recording pressures from below atmospheric to as high as 30,000 psi with instrumentation which is capable of recording at the rate of greater than 1000 cycles per second.

This particular section also deals with the strength of piping, and now reads to the effect that the piping shall be strong enough to withstand any pressure that might be imposed upon it.

Provision for Drain

In the reservoir section it was stated that a well-protected, accessible drain valve should be provided. The object in this was to have something better than a pipe plug, with which it is impossible to empty a reservoir without losing considerable oil. It was suggested by some of the machine builders that a valve might not be necessary, that there are other ways of emptying a reservoir other than by simply letting the oil run out of it, and that the addition of a drain valve might be objectionable. This objection has been eliminated by stating that an accessible means be provided to empty reservoir without spillage.

The section dealing with filters, or strainers, or clarifiers has been revised several times with a view of keeping hydraulic systems as clean as is necessary. It is still necessary to have filtration on every hydraulically actuated machine, and that their action be continuous, but the amount of filtration or degree of fineness of filtration is entirely in the hands of the machine builder. Naturally, he wants to keep out any deleterious materials which would be detrimental to the operation, and that is exactly the wording of the final version. Of course, such things as using filter element to be removed for cleaning without disturbing pipe are still a part of the specification.

Machining Corrosion-Resistant Materials

By Malcolm F. Judkins*

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CORROSION IS DEFINED as a slow wearing away by means of chemical attack, such as oxidation in the air of metals at elevated temperatures, the rusting of metals in moist air and water, or attack by such chemical reagents as acids and alkalies.

The most well-known of all corrosion resistant metals is, stainless steel, of which there are three types. The first of these is ferritic, which is magnetic but non-hardenable and requires careful polishing and heat treatment. The composition for this type of stainless ranges from 0.08 to 0.35 percent carbon and from 11.5 to 27.0 percent chromium. Low carbon, 12.5 percent chrome is used for turbine blades and pump rods; the higher carbon variety (up to 1 percent) is used in cutlery.

The second type, martensitic stainless, contains 0.15 to 1.2 percent carbon, 4 to 18 percent chromium and 0 to 2.5 percent nickel, and is both hardenable and magnetic.

In the third type, austenitic stainless, the carbon content varies from 0.08 to 0.25 percent, chromium from 16 to 26 percent and nickel from 6 to 22 percent. This type, the AISI designation for which is 300, is not hardenable by heat treatment and is non-magnetic.

The effect of the alloying elements in stainless steel is primarily to confer corrosion resistance at high temperatures. In contrast, pearlitic steels, even though highly alloyed, are seldom applicable for temperature service beyond 1200 deg F. In the ferritic group, the chromium refines structure, increases tensile strength and elastic limit without loss of ductility, and increases wear resistance. Chromium, on the other hand, because it is a carbide-forming element, decreases

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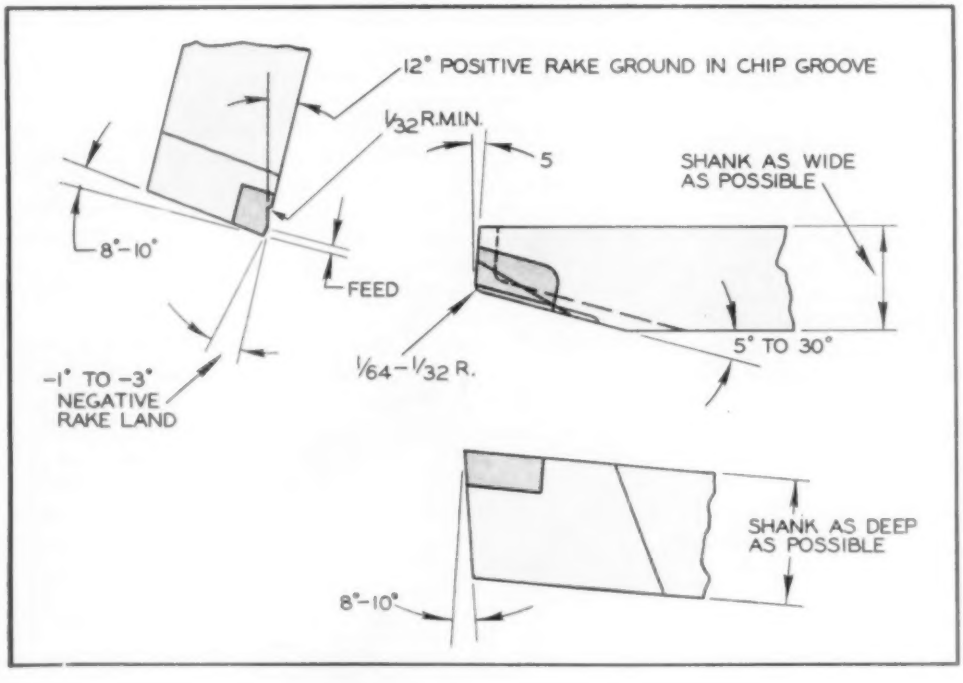


Fig. 1. Single point tool design for machining stainless steel.

machinability because it increases hardness. This condition may be alleviated by annealing.

In the martensitic and austenitic groups, toughness without brittleness is conferred by the nickel content. In particular, nickel improves the low temperature impact toughness, thereby reducing machinability to a greater degree than chromium. At least 7 to 8 percent nickel is necessary to make 18 percent chromium steel austenitic. Chromium in large amounts confers resistance to corrosion under oxidizing conditions, and to oxidation on heating. The addition of moderate amounts of molybdenum increases machinability and permits cutting steels above 270 Bhn, 135,000 psi tensile, which is often designated as the upper limit of practical machinability. Up to 0.25 percent selenium and tellurium, and as much as 0.5 percent zirconium sulfide are added to improve machinability. The resulting non-abrasive inclusions tend to break up the continuity of the ferrite, thus promoting the removal and fragmentation of chips.

Cold Working

As the carbon is increased from 0.05 to 0.2 percent in sheet which has been rapidly cooled from 2100 deg F, the tensile rises from 75,000 to 95,000 psi, while the proportional lower limit remains within the range of 20,000 to 30,000 psi. Bar stock 18-8 stainless is very tough, with a tensile strength of 95,000 to 120,000 psi. Stainless steels, when encountered in the machine shop, are seldom exceptionally hard, abrasive or tough. The elastic deformation of these steels at temperatures below that of recrystallization constitutes cold work and causes the phenomenon of work or strain hardening. By definition, working metal anywhere below the recrystallization temperature is cold work. In practice, however, most cold working processes are performed near or only slightly above room temperature.

The cold working of stainless steel in the process of machining increases its hardness rapidly and considerably; in fact, the extent of the change is much more than can be explained on the basis of work hardening alone. Actually, the austenite is partially transformed to ferrite under cold working, and the resultant structure resembles martensite. Austenite has a high tensile, low elastic strength. It work hardens rapidly, and the elastic strength of cold worked austenite may be brought up close to the ultimate. Austenite is extremely adaptable to deformation, but requires more energy for this deformation than ferritic materials.

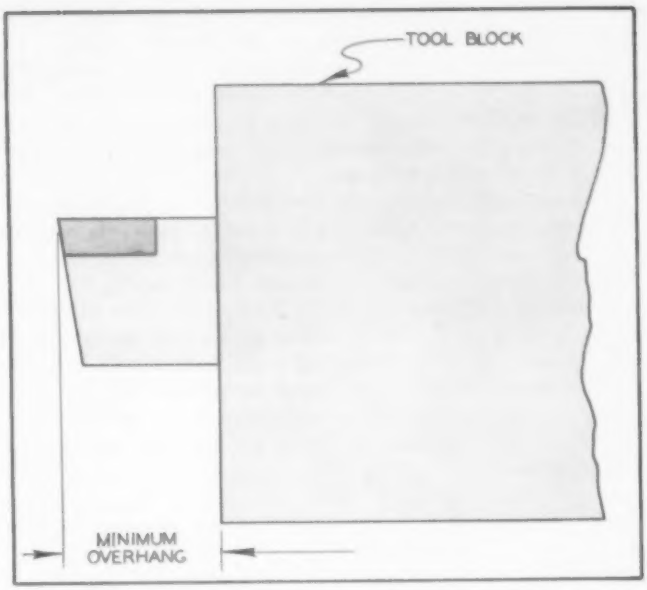


Fig. 2. As shown above, the tool should be supported as close to the cutting point as possible.

Speed of Deformation

Heat-resistant alloys seldom show strain hardening at temperatures of 1800 to 2000 deg F. Cold work progressively raises strength and vastly improves the yield ratio. Tensile of 300,000 and yield of 250,000 psi can easily be obtained by very severe cold work. Physical properties, such as elongation and tensile strength, are greatly affected by the speed of deformation. For example, a slow tensile test with the pulling head moving 0.03 ipm results in an elongation of 87 percent, but when the same test is pulled rapidly at 0.35 ipm, the elongation drops to 59 percent.

Increasing the speed of deformation reduces both ductility and strength. The implications of this fact upon the choice of cutting speed are obvious. Machinability, which may be defined as that property of a metal which governs its performance during machining, is fostered by low strength and

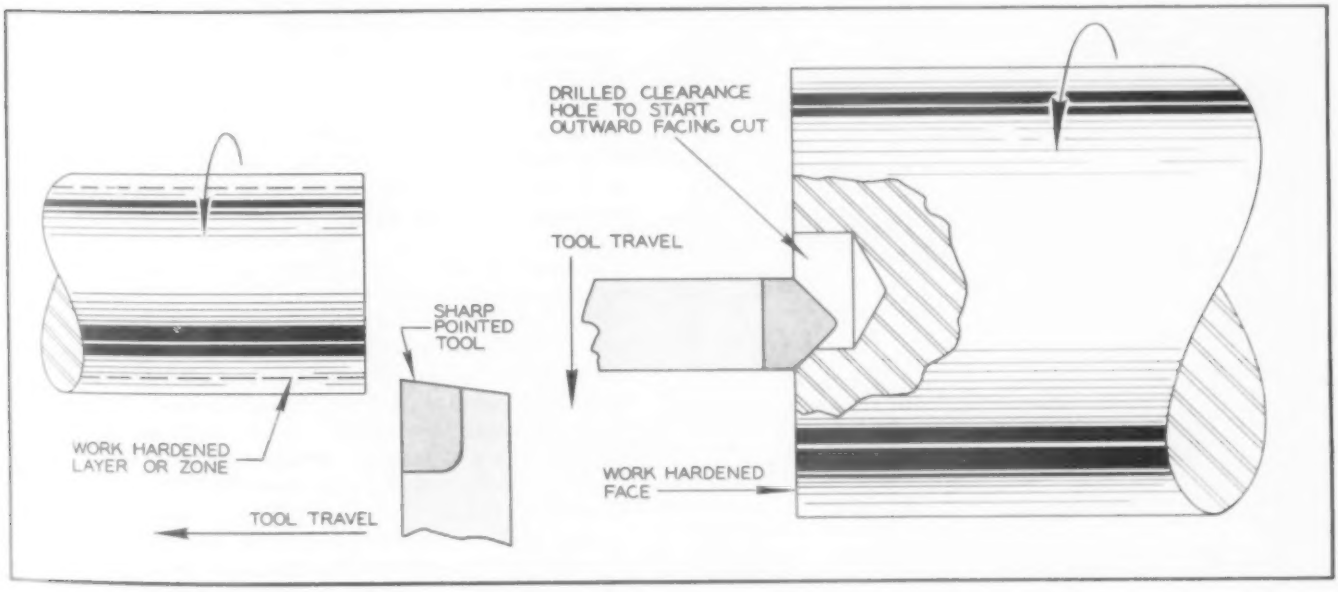


Fig. 3. Alternate methods of removing work hardened surfaces.

low ductility. Consequently, it is often advantageous to increase the cutting speed to promote machinability.

The requirements of the tool engineer and the metallurgist often vary. The engineer may desire low strength, low ductility and low abrasive hardness, but service requirements often oblige the metallurgist to demand properties other than softness and brittleness. In another case, the engineer may wish high strength, high ductility and high abrasive hardness, at least in the finished part. Actually, neither of these combinations of properties is naturally inherent in steel. Great strength is usually found associated with high hardness and low ductility. Low strength, on the other hand, is usually found with high ductility and low hardness. As a result, the metallurgist is asked to produce two unnatural combinations of physical properties, one for machining purposes and the other for service requirements. Optimum machinability is therefore seldom realized. A compromise may be effected by trying to control the hardness within the range of 187 to 229 Brinell and to induce as much brittleness as possible by the combined effect of the alloying elements.

A coarse grain size is often preferable for machining. This can be obtained by controlling the finishing temperature of the hot work performed before machining is begun. Tool design is another important factor in determining machinability and rakes. Clearances and other cutting angles must be selected and maintained with care. Cutting conditions, including feed, cut, speed and cutting fluid, are also important. Tool and cutter performance are influenced by the kind and amount of scale on the surface.

The technique of machining stainless steels is divided into two classes: (1) Preventive measures, designed to avoid the harmful effects of work hardening, and (2) Corrective measures to alleviate the trouble after it has developed. The effects of work hardening may be minimized by avoiding the causes, which include dull tools, intermittent feed, tool rubbing, excessive heat generation, spindle float and slide wear, insecurely held tools, and work and minor machine difficulties which stop the machine or retard its speed.

Machinability is much the same for straight chrome (ferritic) steels as it is for the corresponding carbon steels, except that the carbon content, at which the strength factor becomes too great for good machinability, is correspondingly lower for the alloy steel. Annealing practice for chrome steels is the same as for similar types of structures desired in carbon steels. Ferrite is soft and ductile, with comparatively low strength. It is usually considered difficult to machine because it tends toward large, built-up edges. In addition, chips cling, breaking with difficulty and producing a torn surface and tool wear. Successful machining is made possible by increasing the rake and selecting proper speeds.

Among the ferritic stainless steels, 13.5 percent chrome, 0.35 percent carbon is machinable at a tensile strength of 150,000 psi, 325 Bhn. The 18 percent chrome alloy, with a tensile of 240,000 and 500 Brinell, can readily be machined with carbide-tipped tools when quenched from 1750 deg F. Best results are obtained by machining in the cold worked or cold worked and annealed condition. In this condition, the machining of ferritic stainless is similar to that of 0.4 to 0.5 percent carbon steel. Also available is the 12 percent chrome alloy which, with a high sulphur content, can be cut on screw machines and will rate 90 percent of the machinability of normal screw stock.

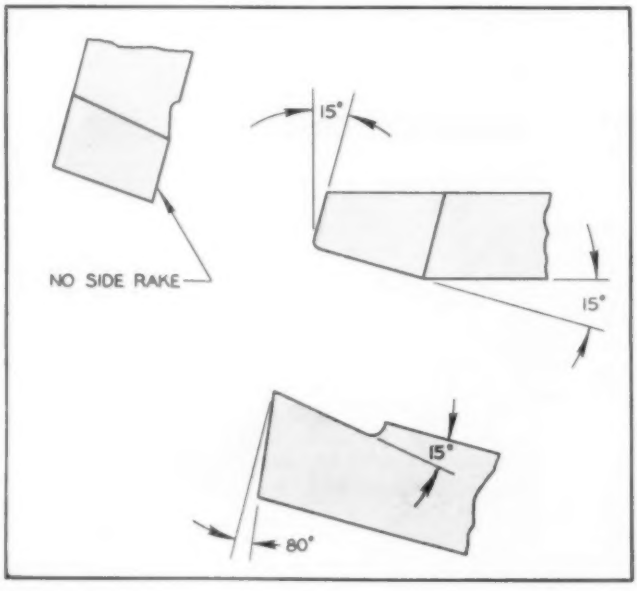


Fig 4 Above is a typical form of high speed steel tool for work on stainless.

Machining Austenitic and Martensitic

The martensitic and austenitic types of stainless are tough, and difficult to machine. All the causes of cold work must be avoided, and the cutting edge must be kept cutting. Best results are obtained by heavy cuts at relatively slow speeds. Drilling should be done at about half the normal speed. Extra care must be observed. All tools should be sharpened, honed and lapped to the keenest possible cutting edges, with frequent resharpening. On automatic machines, the cams should be redesigned for about one-half the normal feed rate for free cutting mild steel. Standard drills effect improved results on austenitic steels if the clearance angles are modified, the flutes polished and ample coolant administered directly to the drill point. It is highly important that the proper angles be preserved on resharpening, through the use of fixtures and careful inspection. In many cases it is necessary to use sulphochlorinated mineral-fatty oil or heavy duty additive type soluble oil, which eliminate fogging and smoking at high temperatures. Scale should be avoided or removed. In this connection, a reducing atmosphere with no oxygen pressure forms a very thin but impervious scale, which is tightly adherent and often highly resistant to pickling. This type of scale may be removed by sand blasting. A suitable scale removing solution can be made by mixing 5 to 25 parts 1.42 specific gravity nitric acid with 1 to 4 parts hydrofluoric acid and diluting the solution with water to make 100 parts by volume. Agitation for 10 to 30 minutes at 130 to 160 deg F will remove ordinary scale. The steel should be cleaned before annealing, because grease (carbon) effects a reduction in corrosion resistance. Carburizing conditions in the furnace must also be avoided.

When, in spite of all precautions, work hardening occurs to an extent which complicates machining, various corrective measures may be taken. The work hardening can be alleviated by annealing at 1850 to 2150 deg F, followed by air or water cooling. Annealing temperatures below 1750 deg F should be avoided, because carbides precipitated by heating may not be completely redissolved and machining difficulties will result. Too high temperatures or too long a heating period induces excessive grain growth, causing a rough, orange-peel surface when machined. High temperatures also promote excessive scale, which is difficult to remove. If the part to be machined cannot be annealed because of the danger of distorting fragile sections, local heating with an oxy-acetylene torch flame may be helpful. Because heating may change the corrosion resistant properties of the steel, it should be undertaken only under the supervision of an expert metallurgist. If neither annealing

nor local heating can be performed, the work hardened area may be removed by grinding with a soft grade wheel and plenty of coolant. Occasionally, as little as 0.010 in. removal of metal will restore normal machinability.

Efficient tooling of stainless steels includes a chip control groove, ground in the face of the tool at approximately 12 deg positive rake with a negative land from -1 to -3 deg of the same width as the feed. About 8 to 10 deg front and side relief with approximately 5 deg end cutting edge angle should be used, as well as the smallest nose radius commensurate with good tool life. (See Fig. 1.) The largest possible tool shank should be used, supported as close to the cutting point as possible (Fig. 2). Cutting off tools should be made without rake or with slight negative rake with about 3 deg front relief. Feed cams should be relieved at about 0.005 in., to avoid dragging the tool back over the machined surface. If work hardening occurs, the tool being used should be replaced with a newly sharpened pointed tool, and a new cut should be started from the outside with hand feed and greatly reduced speed, to remove the glazed areas. If the end of a cylindrical work piece is work hardened, a series of cuts should be taken at right angles to the hardened surface, applying the tool in the direction of its least depth. An alternative method, shown in Fig. 3, is to drill out the center very slowly to a depth which will permit a facing tool to take an outward cut. Drilling should be performed at one-half to two-thirds the normal speed for mild steel, at 20 to 30 percent finer speeds, with short, lapped edge drills. For penetrating hard layers, the point angle should be changed to 105 deg, and the usual 12 deg clearance modified by grinding an 8 deg land 1/64 in. wide. This is especially helpful on drills less than ¼ in. in diameter.

Stainless steel is rapidly becoming more of a tonnage steel than a tool or alloy steel. It is used for all types of construction, including numerous phases of jet propulsion. It has invaded the aircraft field, where, because of its great strength-to-weight ratio, it is competing successfullly with aluminum alloys in highly stressed units. Even 8 in. diameter pipe is now manufactured from stainless steel.

Research on Machining

Because of the rapidly growing interest in this subject, many of the largest steel companies have undertaken extensive research programs in the machining of stainless steels. Preliminary results on 18-8 stainless indicate that the conventional types of bar turning equipment now in use in most of the older plants do not have sufficient speed to take full advantage of sintered carbide tools. Even the cast alloys gave inconsistent results on existing equipment because of chatter. High cobalt 18-4-1 produced a tool life of 3½ hours at about 65 fpm and ¼ in. feed. Best results were obtained with 8 deg front clearance, 15 deg back rake and 0 deg side rake, and the use of 2 percent sulphurized cutting oil. A typical form is shown in Fig. 4.

In the milling of Type 410 stainless, it is difficult to judge when the cutters are ready for resharpening. Almost immediately upon beginning the cut, small pieces chip from the face of the carbide tip. A suitable sulphurized oil tends to delay this condition, and also helps to avoid work hardening. Of various rake angles tried, 10 deg negative radial and axial proved to be the best. Excellent results are obtained from 3/16 in. deep cuts at 0.008 in. feed, with 10½ in. diameter cutter with carbide-tipped inserted blades, cutting Type 410 stainless 159 to 187 Bhn 3¼ in. wide at 770 fpm. This is further illustrated in Fig. 5.

On the basis of extensive milling tests, the order of decreasing machinability of the materials investigated is: (1) Type 416, 159 to 187 Bhn; (2) Type 18-8, 192 to 197 Bhn; (3) Type 410, 159 to 187 Bhn; and (4) Type 440-A, 241 to 255 Bhn. Another milling operation of 0.85 percent carbon, 12 percent chrome with 13 in. diam, 24 tooth positive and axial negative radial rake cutter, face milling 9 in. wide by 6 ft long and ⅛ to 3/16 in. deep at 57 rpm (about 200 fpm) at 40 ipm feed, gives an eight-hour cutter life. Die blocks of 350 Bhn are face milled full cutter diameter to a shoulder, ⅛ to 5/16 in. cut, 49 ipm, with a 13 in. diam. cutter at 7½ ipm feed. This results in 12,000 sq. in. per cutter sharpening, or approximately 3,000 cu in. or 752 lb of chips per grind. The face milling of special high temperature, high alloy stainless turbo-jet rotors 14 in. in diameter, 4 in. thick in a turret lathe, using 1¼ in. square T-83 tools and removing nearly 1½ in. of stock from each side in two cuts at 0.0115 feed and 165 fpm, produces up to 4 rotors, faced on both sides, per grind. Stainless valve seat rings, 500 Bhn, are bored at 0.008 cut, 0.002 feed, 350 fpm with Type TA carbide, producing 100 pieces per grind. The boring and turning of 18-8 beer dispenser valves at 0.025 to 0.050 cut, 0.005 feed and 300 fpm, yields 230 pieces per grind with Type T-89 carbide. Weldment flake ice evaporator drums, 18-8 stainless, 18 in. round and 24 in. long, are roughed and finished in 22 minutes, as compared with the previous grinding time of 4½ hours. Roughing is at 1/32 in. cut, feed is 200 fpm, and finishing at 0.010 cut, 0.020 feed, 400 fpm. Type 302 stainless rod, having a 0.388 in. diam. and an 85,000 psi tensile strength, is drawn to 0.25 in. diam. in one pass (58.5 percent reduction) at 80 rpm (about 520 fpm) on a 26 in. diam. Morgan block. The drawn wire has a 190,000 psi tensile strength. An excellent surface is produced by using a Type H-13 die nib.

These examples should serve to show that stainless in all its forms can be and is being machined without undue difficulty with both high speed steel and sintered carbide tools. Although the machining of these work hardening alloys requires a different technique from the machining of ordinary screw stock, proper attention to the prevention or removal of scale, the avoidance or correction of the harmful effects of work hardening, the selection of the proper cutting tool materials and cutting tool conditions, and the employment of efficient tool design and methods, should enable manufacturers to further extend the use of corrosion-resistant materials so that vast sums now spent for replacement of structures and mechanisms destroyed by corrosion can be saved.

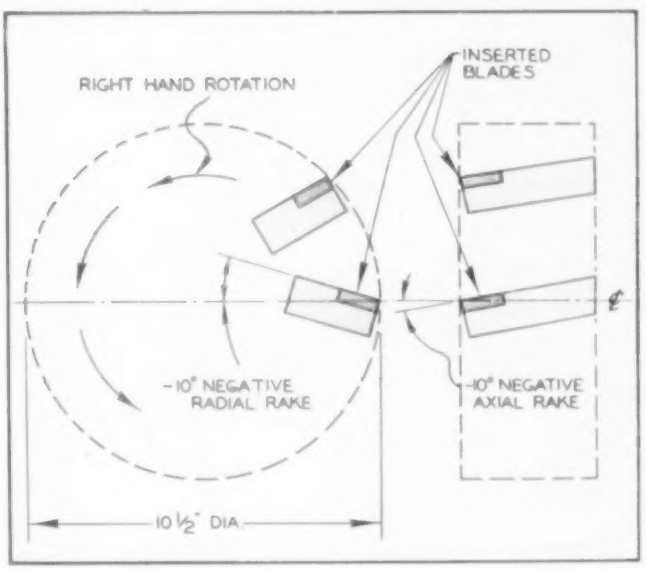


Fig. 5. Face mill design for stainless steel.

The Mathematics of Straight Form Tool Design

By Merle L. Deckard *

DIMENSIONING OF DRAWINGS for forming tools, in essence a trigonometric function, is a critical operation which becomes considerably simplified through observing certain fundamental practices.

Fig. 1 illustrates a simple part which might be made on a hand screw machine. Also shown is the form tool which is to finish its two diameters and face the shoulder. The cutting face of the tool is shown at *B* in Fig. 1. It can be noted that the 0.250 in. step is equal to half the difference of the two diameters; this is shown as *XY* in the elevation view *D*. However, when finish grinding (not sharpening) the tool, it is set up on an angle plate or similar device and placed on a surface grinder in such a way that the line *WY* is horizontal. Then from the principles of geometry, angle *YXZ* is equal to angle α, the clearance angle, which in this case will be 10 deg. The line *XZ* in turn becomes the depth to which the step must be ground to attain the 0.250 in. step *XY*. The triangle *XYZ* is a right triangle with the right angle at *Z*. Therefore

$$XZ = XY \text{ cosine } \alpha \qquad (1)$$

or in this case $XZ = 0.250$ in. cos 10 deg = 0.2462 in. The 0.406 in. and 0.750 in. dimensions are not affected by the clearance angle α. The facing edge *UV* must also be cleared, and this feature will be discussed later. The 1/64 in. radius is not critical, and will be ground on the tool as a final operation.

A similar part is shown in Fig. 2, with the exception that this part contains a 30 deg angle. On the sketch of the cutting face *B* of the tool, we construct the right triangle *MNP*. The 30 deg angle, according to the common use of rectangular co-ordinates, is measured by its tangent. Thus $\frac{MN}{NP}$ = MN is identical to the line *XY* shown in view D.

Referring to view D, we see that the true depth of the angle (perpendicular to *YW*) is *XZ* instead of *XY*, while the length *NP* remains the same. If we foreshorten the depth *MN* (or *XY*) by the cosine of the clearance angle, as in the previous example, the result is the tangent of the true angle β to be ground on the tool. Therefore

$$\tan \delta^* = \cos \alpha \tan \beta \qquad (2)$$

In this case, tan 30 deg cos 10 deg = tan β, and β = 29 deg 37 min. This angle β will probably be dressed on the grinding wheel, but the tool may also be set up on a compound sine plate.

When a tool becomes dull in operation (as evidenced by drift of dimensions or excessive heating), it must be sharpened by grinding down the cutting face. This is a machine grinding operation, and should never be performed "off hand". After sharpening, the tool must be shimmed or blocked up until its cutting face is again even with the center of the work.

After repeated sharpenings, a point is reached where the tool is no longer sturdy enough to produce a good finish on the part. Dimensionally, the amount which may be removed by sharpening before this point is reached is known

*Note: The angle δ must always be measured from the centerline of the part, not the face.

*Member Detroit Chapter No. 1, ASTE.

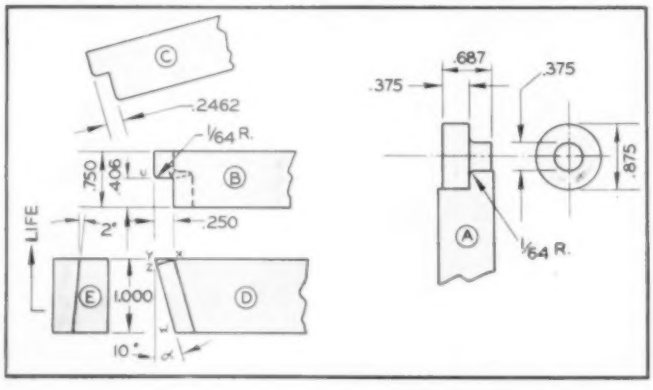


Fig. 1 is a typical hand screw machine part. At right is the form tool to finish the diameters and face the shoulder.

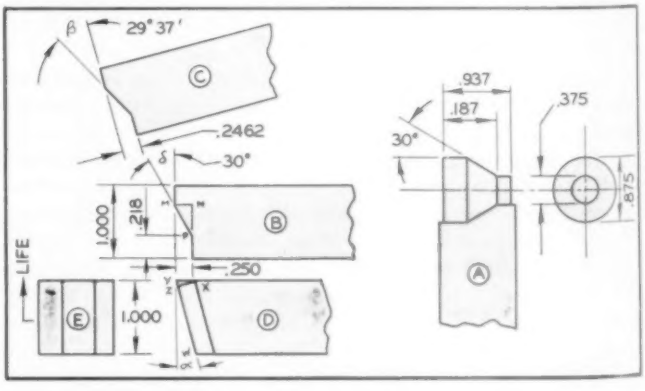


Fig. 2. Another part of similar design is shown above, with the exception that this part contains a 30 deg angle.

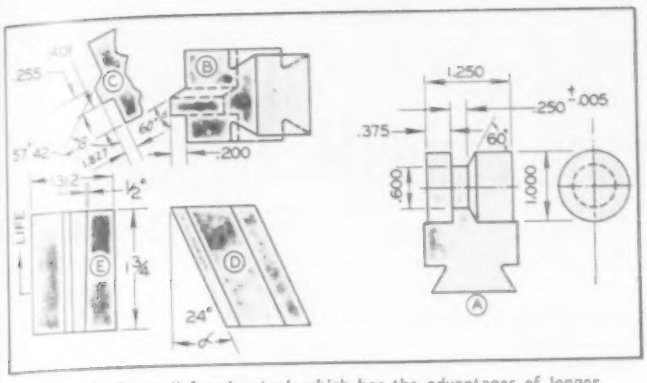


Fig. 3. Dovetail forming tool, which has the advantages of longer life and easier replacement after sharpening.

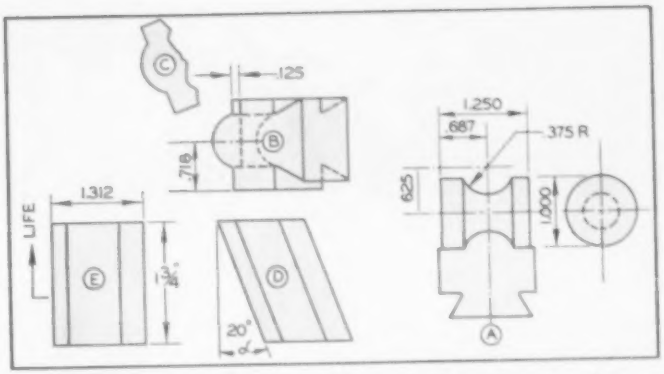


Fig. 4. The form normal to the body of this tool is an arc of an ellipse, necessitating a like female arc on the grinding wheel.

as the "life" of the tool. This is shown in the figures.

Now, we return to the side clearance on the line *UV* (Fig. 1) as mentioned in a previous paragraph. It is apparent that if no side clearance is provided on this line, the surface beneath it will rub on the revolving face of the part. This causes an abrasive action and produces excess heat, both of which are detrimental to the tool and the piece part. It is a simple matter here to give this line a side clearance of 2 deg, as shown in view *E*. Since the tool is wider than the length of the finished part, the projection of the part will still be wide enough for use throughout the life of the tool. An inspection of Fig. 2 will indicate that an angle (as δ) is self-clearing, and no side clearance is required.

A dovetail forming tool is shown in Fig. 3, such as is used in various automatic screw machines. The cutting face is on the end of the tool, and the whole tool is held at the clearance angle α by a special dovetail holder. This tool has two distinct advantages. First, after sharpening the tool, it is easy to replace it in proper position in the machine, as the toolholder has not been moved. The height of the cutting face may be gaged and the tool clamped into place. Second, the life of the tool is considerably longer than that of the ordinary straight forming tool. However, this very length of life presents a problem of its own. This is shown in Fig. 3. If the straight wall of the 0.250 in. dimension is given much side clearance, the 0.250 in. dimension cannot be maintained. This is handled in the following manner.

There is a total tolerance of 0.010 in. on the 0.250 in. dimension, making the high dimension 0.255 in., and the low 0.245 in. Advantage is taken of this tolerance to make the dimension 0.255 in. on the top face of the tool, and 0.245 in. at a line representing the face of the tool at the end of its life. This gives 0.010 clearance in the 1¼ in. of tool life, which is equal to a clearance angle of 0.5 deg, a sufficient amount. Although the dimension on the piece part will change throughout the life of the tool, it will always stay within print tolerances.

The 60 deg angle on the tool becomes, by formula (1), 57 deg 42½ min., as shown in view *C*.

When a form having other than straight lines is to be ground on a tool, as, for example, the radius shown in Fig. 4, the above method cannot be used. While the form on the cutting face is a true radius, the form normal (perpendicular) to the body of the tool is an arc of an ellipse. To produce the male elliptical arc on the tool, it is necessary to dress a like female arc on the grinding wheel. This can be accomplished by using an ordinary cradle radius dresser as shown in Fig. 5. The dresser is set up to strike a 0.375 in. radius in a vertical plane parallel with, but not through the axis of the wheel. It is offset from the axis of the wheel by the amount *JK*. The offset distance *JK* is found in the following manner. Angle *JOK* at the center of the wheel is equal to the angle in Fig. 4. The radius of the grinding wheel is *OJ*, which will be taken as 3½ in. From trigonometry

$$JK = OJ \sin \alpha \qquad (3)$$

or JK = 3.500 in. sin 20 deg = 1.197 in.

For complicated and irregular forms, a duplicating dresser such as the familiar "Copy Cat" must be used. With this, the form of a previously ground template is duplicated on the grinding wheel. Fig. 6 shows the setup to duplicate the form of the template *G* on the wheel. The template *G* is the exact form of the finished part. The dressing diamond moves in a horizontal plane and the offset *JK* is vertical. Note that in every case the offset must "trail" the rotation of the wheel. This is merely a restatement of an everyday grinding "must".

The template is commonly ground from a piece of hardened gage stock or an old power hack-saw blade. Occasionally it may be cut from a finished piece part.

The duplicator method may be used to make a tool of any form, including the ones shown in Fig. 3. However, for simpler forms, such as the two mentioned, the method shown previously generally prove more suitable, since no templates need be made.

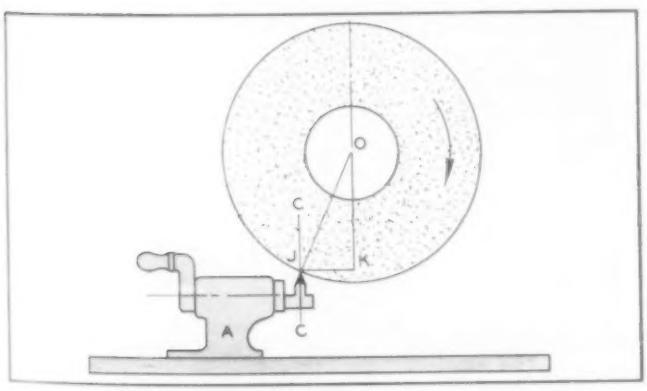


Fig. 5. This cradle radius dresser is used to produce an arc on the tool similar to that shown in Fig. 5.

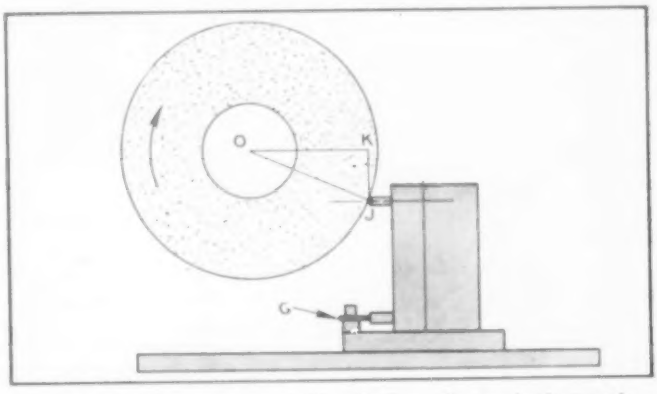


Fig. 6. The setup above utilizes the form of a previously-ground part to duplicate the form.

Atomized Coolant Spray Speeds Grinding

By J. A. Harrington* and V. H. Childers

RESEARCH DEPARTMENT, THE DOALL COMPANY

DIFFERING CONSIDERABLY FROM conventional wet grinding in the application of the coolant to the work, the recently-developed cool grinding technique shows significant results in usage to date.

Whereas in wet grinding the coolant is applied directly to the work, and consumption amounts to five or six gallons per minute, the cool grinding process utilizes centrifugal force to "pull" the coolant through the porous channels of the wheel (Fig. 1).

This action is shown in Fig. 2, where a match flame is drawn into the wheel, rather than down along the sides. A similar effect is obtained when the coolant is applied to the sides of the wheel, and centrifugal force atomizes the fluid by mixing it with air. The mixture is then forced through the porous channels of the wheel to the outer edge, where the cutting action takes place.

The process eliminates many of the disadvantages inherent in both the wet and dry grinding methods. For example, in form grinding the dry technique is often employed to avoid flooding of the work surface by the coolant. Since the atomized spray accomplishes a similar end while at the same time preventing grinding cracks or burned surfaces, work spoilage is reduced.

Conventional wet grinding, in many applications, results in the work surface being considerably overheated. Often as an end result there is a change in the structure of the steel, sometimes to the depth of 0.032 in. below the surface, as was shown in a recent paper.[1] An effort is sometimes made to avoid this by slowing down the speed of the wheel to approximately 400 rpm, but while this shows an improvement in grinding over speeds of from 5000 to 6000 rpm, the time required for the job increases in proportion. Utilization of centrifugal force in the wheel with the cool grinding technique permits heavier cuts with recorded improvements of as high as 600 percent between sharpenings with an average tool life increase of about 150 percent.

Research has indicated that the process can be carried on with any type of vitrified or silica wheel. Since the coolant is projected through the wheel at high force, the atomizing or misting effect reduces the volume of the coolant required as well. This can be seen when it is considered that it is the surface of the fluid which absorbs the heat, and since in atomizing, the surface is expanded enormously, the heat-absorbing properties of the fluid are increased proportionately.

Applications of the Process

The grinding of carbide-tipped tools is a good example of the process in use. The tool shown in Fig. 3 was photographed after being ground halfway across its width to a

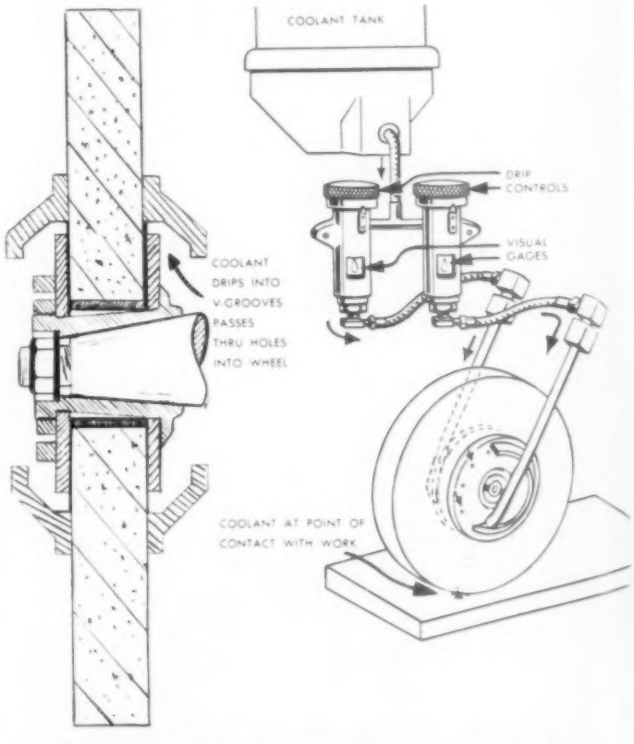


Fig. 1. Schematic diagram, showing how the coolant, applied near the center of the wheel, is drawn by centrifugal force to the cutting edge.

*Member Twin Cities Chapter No. 11, ASTE.

[1]Tarasov, L.P., and Lundberg, C.O.; "Nature and Detection of Grinding Burn in Steel." Transactions, ASM, Vol. XLI, 1949.

depth of 0.020 in. The feed was 0.020 in., table speed was 30 fpm. A silicon carbide wheel of 60 grit and "J" hardness was used. The wheel lost 0.005 in. radius after grinding the entire top area of $\frac{5}{8}$ x 4 in.; probably considerably less than would be the case with conventional grinding.

A second example of cool grinding applied to carbide tipped tools is shown in Table I. The steel of the tool shank had to be ground at the same time the carbide tip was ground. A 7 x $\frac{1}{2}$ in. silicon carbide wheel of 60 grit and "J" hardness was used in both cases; the same grinder was also used to obtain a true comparison. While conventional grinding produced both burns and grinding cracks, there was evidence of neither as a result of the cool process.

TABLE I—GRINDING COMPARISON ON CARBIDE TIPPED TOOL

Wheel Lowered	Material Removed Cool Grinding (In.)	Material Removed Conventional Grinding (In.)
0.001	0.0010	0.0004
0.002	0.0020	0.0007
0.003	0.0030	0.0010
0.005	0.0050	0.0020
0.010	0.0085	None
0.020	0.014	None

Some of the tougher high speed steels of the high chrome high carbon type are difficult to grind, and particularly so when it is necessary to plunge grind form work. The following example describes a plunge grinding production job on this material. It was necessary for the operator to see the work to prevent as much burning as possible.

A 120 grit wheel of "L" hardness was used in both cases. When dry grinding, the wheel was fed into the work 0.0001 in. at each pass. When the heel had been lowered 0.001 in., the piece was checked on an optical comparator and it was found that the wheel was broken down 0.0002 in. in some parts of the shape, and 0.0004 in. in others. Since the tolerance on the part was 0.0002 in., it was clear that the wheel had to be reformed every time a cut of 0.0005 in. was ground in the work. Burning occurred, although the operator took very light cuts.

Using the same wheel with the atomized spray technique, the cuts were raised from 0.0001 to 0.0004 in. per pass, and 0.0008 in. per pass. After the wheel had been lowered 0.015 in. into the work the form was again checked, but no evidence of wheel breakdown was seen. The piece was again placed on the machine and an additional 0.016 in. of material was removed, using the same amount of cut per pass. The form then showed that the wheel had lost a maximum of

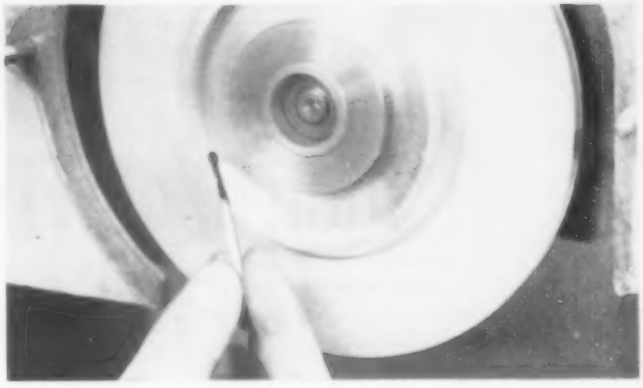


Fig. 2. The flame from the match above being drawn into the center of the wheel illustrates the centrifugal action involved.

0.0002 in., which was still within the tolerance allowed. There was no evidence of cracks or burning.

A further example involved a piece of oil-hardened tool steel, which had to be plunge ground to close tolerances, and was of such shape that it was about 4 in. above the chuck. When wet grinding was tried, the coolant splashed over the guards and the work could not be seen, so dry grinding was tried. A 60 grit "J" hardness wheel was used and formed with a 15 deg angle on each side. Cuts of 0.001 in. were made at each pass, except that when finishing, 0.0005 in. cuts were used. The wheel had to be formed ten times to complete each piece, as a tolerance of 0.0002 in. was specified. The heat generated caused some warping as well as a number of rejects. Using the same wheel and grinder with the centrifugal spray process, the piece was finished without reforming or dressing the wheel. Cuts of 0.005 in. were used for roughing and cuts of 0.0005 in. for finishing. No warping or burning occurred, and production increased 40 percent.

Air Blast Blows Away Coolant

The reason for increased tool life with this spray of coolant can be seen from Fig. 4. When the wheel is passing over the flat surface of the work, the air blast from the spot directly under the wheel, where the cutting action is taking place, blows the coolant away from the work. Thus the surface heats to a temperature above the proper point for the steel being ground. As the piece proceeds, the coolant flows back over the heated surface, giving it a quick quench which promotes surface or grinding cracks, many of which are not visible at the time. In addition, in many instances the actual cutting edge of the tool does not get the proper amount of coolant to keep the temperatures down to a suitable level. The result is that the characteristics of the steel are changed at the cutting edge, and the life of the tool is shortened.

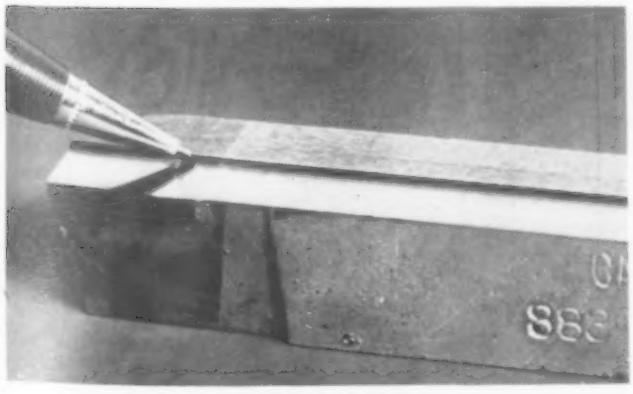


Fig. 3. Cemented carbide tool after having been ground halfway across its width, using the atomized spray process. Depth of cut is 0.020 in., feed 0.015 in., and table speed 30 fpm.

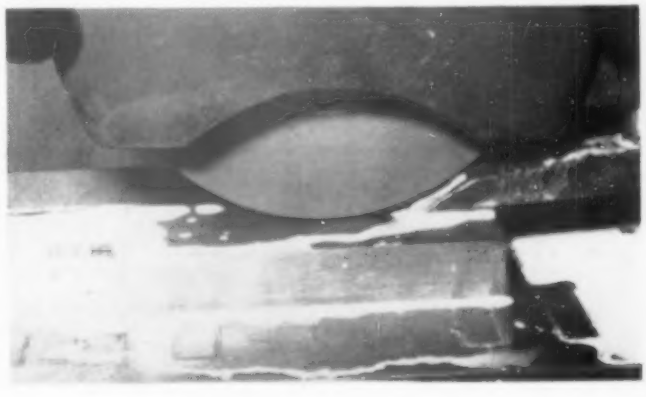


Fig. 4. As shown above, in normal wet grinding the blast of air from the wheel blows away the coolant and leaves the surface bare.

Design of Fixture Elements

Types of Fixtures

By Hans W. Smith

PREVIOUS ARTICLES HAVE discussed in detail some of the fundamental components of fixtures, and this installment describes the principal types in current use.

Fig. 1. Procedure in laying out a drilljig. Decide in which position the work is to be held. Lay out work in two or three views. Draw in bushings at proper distance from work. Draw in rests and locators, bearing fixturewalls and bottom in mind. Draw in clamps same way. Build fixture walls around and into this and complete fixture.

Fig. 2. A typical small drilling. The angular screw pushes the work against three stops. Work sits on one long and one short rest. Strapclamp holds work down on long rest. Bushing plate fastened to ribs integral with stops.

Fig. 3. In most cases, a drilljig is fastened to the machine table of the drill press and the work placed in it. When the work is very large, it becomes easier to handle the jig than the work. Then the jig is made as a drillplate with stop lugs and clamped onto the work. The illustration shows a broken planview of a drilljig assumed to be very long in the direction indicated by the breakline. The stop for the work is connected to the rest of the fixture by a long narrow strap. Thus the fixture becomes much lighter than the work and is easier to handle.

Fig. 4. When holes must be drilled in two planes and the fixture is not too large, a tumble fixture is used. Such a fixture has legs on faces in two planes permitting it to be set up in two ways. Thus holes can be drilled in two planes without unloading.

Fig. 5. This illustration shows a drilljig where one bushing sits under a small angle to the main bushing. The fixture is set on a sub-base and hinged so that it can be tilted into a new position, bringing the angle hole into vertical position for drilling. The tilted position is shown by broken lines in the illustration.

Setup for Multiple Drilling

Fig. 6. Multiple drilling. This drilljig is to be used under a multiple drillpress, drilling many holes at once. The drillplate carrying the drill bushings is fastened to the head of the drillpress, thus the drills never leave the bushings and

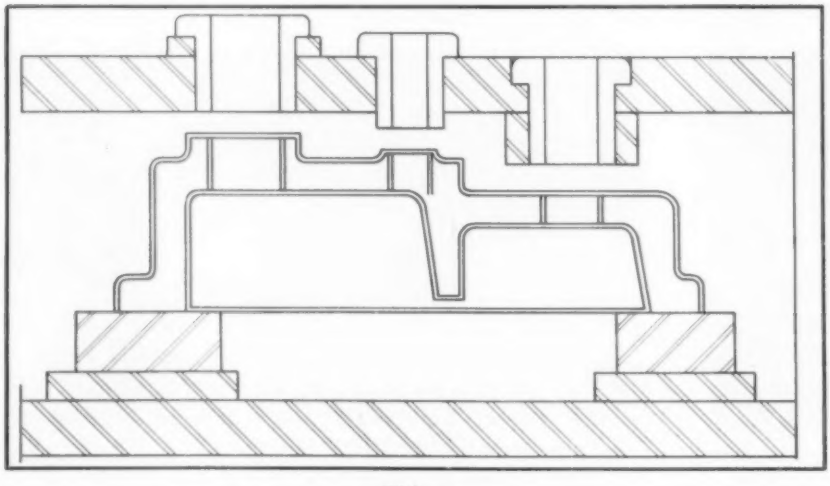


FIG. 1

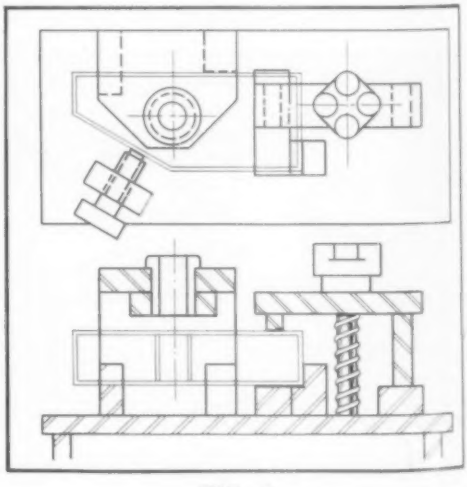
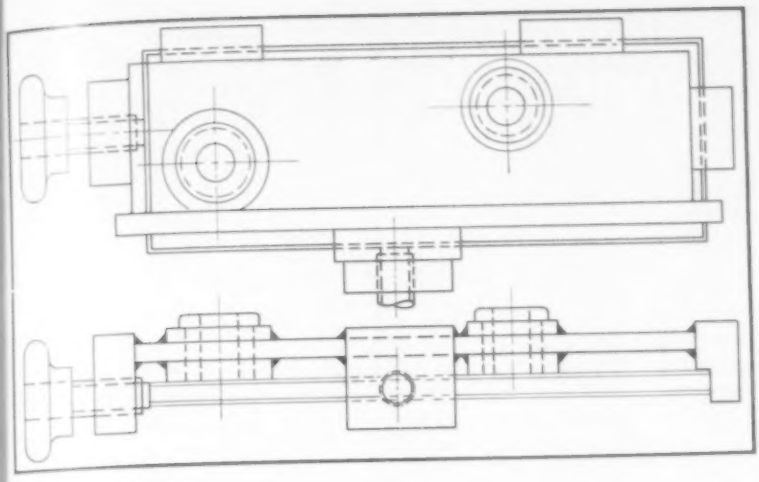
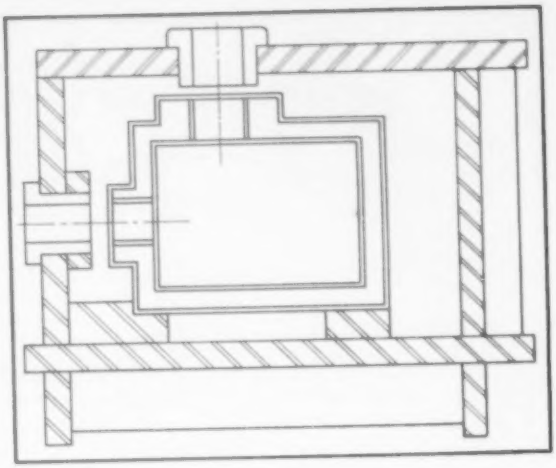


FIG. 2





(ABOVE) FIG. 3, LEFT; FIG. 4, RIGHT

the jig is open for easy loading. The work is held in the lower part of the jig in the conventional manner, except that there are leader pins to guide the drillplate into proper place for drilling.

Fig. 7. When holes are to be drilled under various angles but all in one or parallel planes, the work is placed in an index drilljig. The boxtype fixture is mounted against an index base which permits rotating it and holding it at the desired angles. An index pin guided in hardened bushings holds the index plate and fixture at the various stations. The pin is operated by a handlever. The box fixture should be mounted so to the index plate that its center of gravity comes near the index center to make turning easier.

Fig. 8. For heavy work, support on one pin, as shown for the index drilljig Fig. 7, is inadequate. In this case, a trunnion fixture is employed. It is a boxlike drilljig with two trunnions held in bearings on a common base and provided with an index plate and pin to hold the box fixture in the required position. The trunnions should be located near the center of gravity of work plus box fixture so that the force required for turning is kept to a minimum. The trunnions should not be made integral with the box, but held in a separate block screwed to the wall of the fixture.

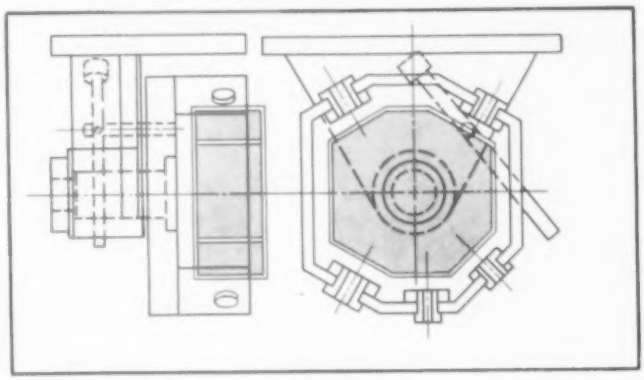
Fig. 9. A double trunnion fixture permits turning the box jig in two planes, with drilling permitted on six sides. The trunnions are in this case loose pins with handles. Drilling the work on all sides without removing it from the fixture effects considerable savings in handling costs.

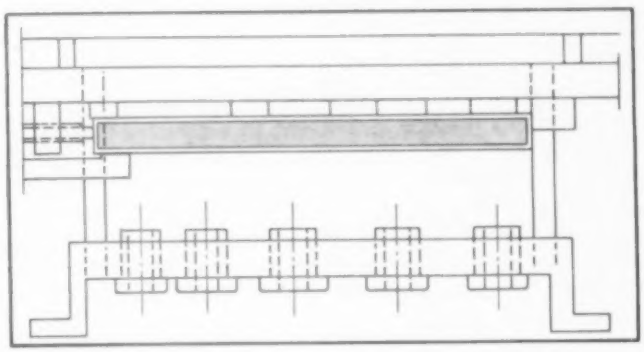
Locating Center of Gravity

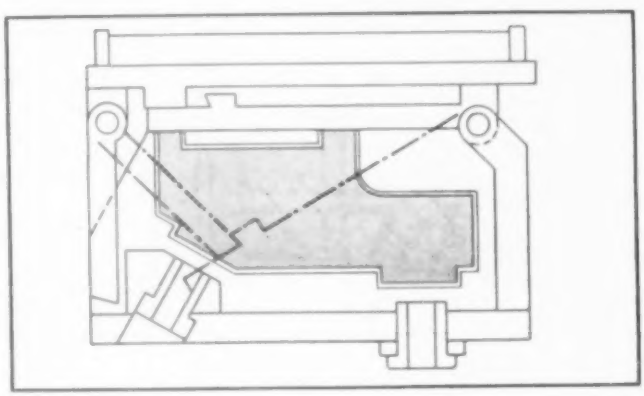
Fig. 10. The trunnions of a trunnion fixture (see Fig. 8) should be located near the center of gravity of work plus fixture. It is possible to determine this center approximately from the drawing, but frequently some correction is desired in assembly. For this reason it is well to mount the trunnions in a separate piece, bolted to the fixture so that correction for the center can be made.

The center of gravity can be found by calculation or through experiment. The latter method is frequently quicker and is illustrated here for a complete piece of work. The work is placed on a pipe so that it balances and the centerline of the pipe is marked on the work. The process is then repeated, placing the pipe under a different angle. The intersection of the two lines give the center of gravity, that is the center is on the vertical above this intersection. If it is possible to repeat the process in another plane, the resulting intersection will give the center of gravity.

(TOP TO BOTTOM) FIGS. 5, 6 AND 7







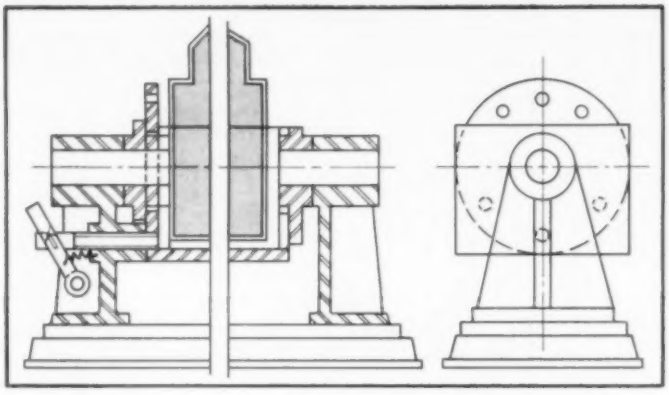


FIG. 8

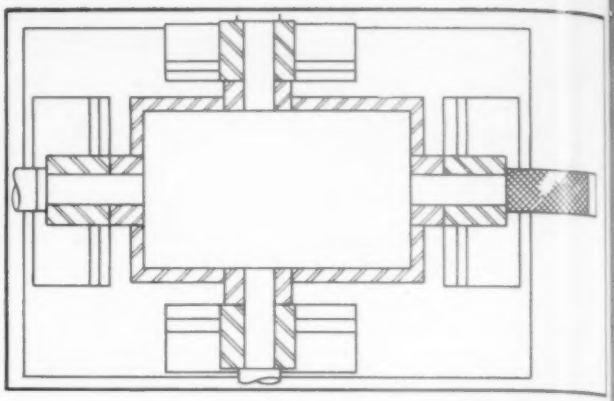


FIG. 9

Fig. 11. When the shape of the work is practically a plate, the center of gravity may be determined by suspending the work from a hoist, marking the vertical. The process is repeated after the work has been turned so that another vertical can be marked. The intersection is the center of gravity.

Fig. 12. Often the shape of the work does not permit the use of either of the two methods mentioned in Figs. 10 and 11. This illustration shows another method which will permit determination of the center of gravity in most instances. The work is balanced on an arrangement similar to a scale, using a known weight P to balance the weight W of the work. Then the distance a is measured. Since $Pa = Wx$, x is found to be $\frac{(Pa)}{W}$. Thus x determines the center of gravity.

Fig. 13. illustrates a method of finding the center of gravity by calculation as previously mentioned. The work is split up into various sections, given by its geometrical shape. They are marked *A, B, C, to F*. The weight of the sections attacking in the center of gravity of each section is marked P_a, P_b . . . . P_f. The distance of the forces exerted by the weights from an arbitrary fulcrum is marked as *a, b . . . . f*. Considering 1-1 as a line around which the forces would turn we have as the sum of moments:

$$P_a a + P_b b + \ldots . P_f f$$

All the forces summed up here can be considered equal to the total weight acting at the center of gravity. That is, the above expression is equal to Wx. Since W equals the total weight or $\Sigma P_a + P_b + \ldots . P_f$ thus X can be calculated, giving a line along which the center of gravity is located. By repeating the process around a second axis, 2-2, another distance Y is found and the intersection of X and Y yields the center of gravity.

Fig. 14. illustrates a case where a fixture had to be balanced again because the work had been changed and a balance weight B had to be added to meet the new conditions.

The combined center of gravity of fixture and product be "*A*" as shown in sideview, its weight be P_a, then the required counterweight B must be thus, that: $P_a a = P_b$ If, furthermore, the fixture is required to be balanced in a second plane in order to be rotated around a point C as shown in front view, then this point must be picked so that $P_a c = P_b d$. Since this balance is to be maintained under any angle around the center, the counterweight B must be placed so that the lines AB pass through the trunnion center shown in sideview and through point C shown in the front view.

Checking Location of Bosses

Fig. 15. For many castings the first machining operation is milling. For this operation the work is set on suitable bosses cast on the work. To get uniform work and come out right with stock allowances on later operations it is important that these bosses be checked with regard to the main points of the castings. This is done in a checking fixture, a box-type housing into which the work is set. The fixture has rotary scribers where a bore is to be made later, scribing faces where a pad is to be later machined, swinging gages where the stock thickness of the work at a certain point must be checked and where the height of the bosses just mentioned must be checked. The work is set in place by checking all the important points, moving the work with screws in the fixture into a position satisfying or compromising with all conditions. The bosses for the first milling operation are then ground with a hand grinder according to a swinging gage. Lines are scribed on the work showing that sufficient stock is there for machining. If not, the work is rejected before costs are run up for partial machining.

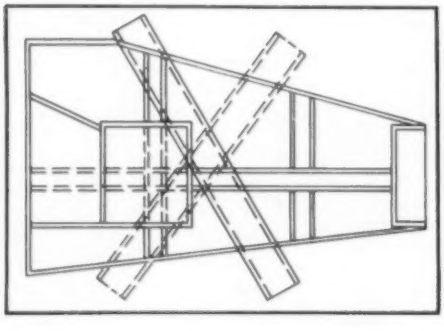


FIG. 10

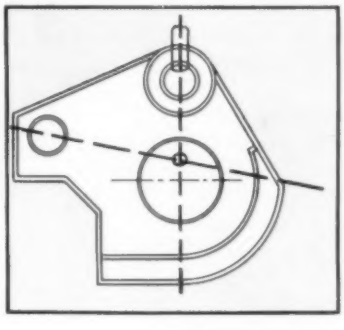


FIG. 11

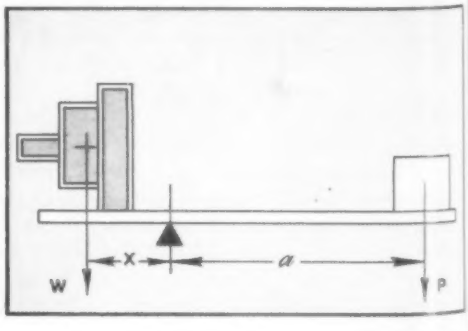


FIG. 12

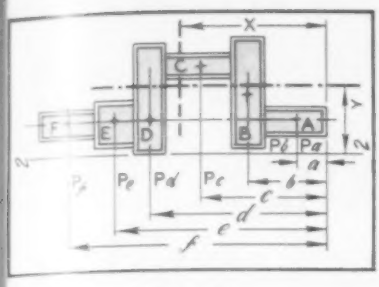


FIG. 13

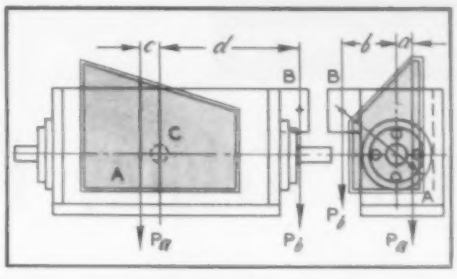


FIG. 14

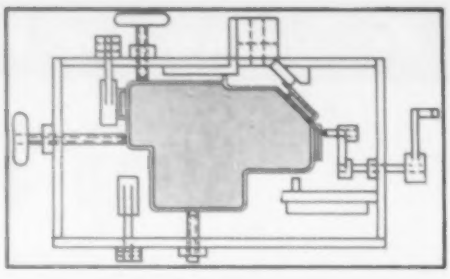


FIG. 15

Fig. 16. shows a swinging gage to be used in connection with the checking fixture shown in Fig. 15. The work must interfere with the gage for the amount of the required finish-stock, or if the boss is one to rest the work on for first milling it is hand ground to suit the gage.

Fig. 17. illustrates a scribing arm, operated by a crank from the outside. The scriber is pushed against the work and a line scribed onto the work showing the stock left for boring.

MILLING FIXTURE DESIGN

In contrast to drilljigs, milling fixtures must be heavily constructed. The forces which the fixture has to withstand are much greater and more important, and in addition the fixture must be heavy to withstand chattering. For this reason clamps are drawn up tighter and should be made heavier than for drilljigs. The fixture walls must take the heavy thrust exerted by the cutter. Frequently two or more faces are milled at the same time and where these forces add up the fixture must be proportionately strong.

A milling fixture has rests to set the work on, stops to locate it in a certain position, and clamps to hold it securely on the rests against the stops. It also has a gageblock to set the cutter for the proper depth of the cut. It has keys to align it on the milling machine table.

Fig. 18. shows the heavy strapclamps used to hold down the work for milling. The clamp exerts its force at a solid portion of the work, where great force can be used without bending the work.

Fig. 19. shows the plan view of a milling fixture. The work rests and is held against a combination rest and stop (3). The milling thrust is taken by a stop (1). The work is held down by a strapclamp, which is cut under an angle to gain some length. In this case the work is to be milled on two faces (marked by a heavier line) which sit higher than the blocks and clamp. In line with these faces, but below them, are the faces of hardened and ground gage blocks, 2, for setting the cutter. These blocks are so ground that their use requires a 1/64 in. shim, indicated on the drawing.

Fig. 20. Plan and side views of a double milling fixture. While one part is being milled, the other side can be unloaded and reloaded. The principal parts of the fixture are the same as explained in Fig. 19. The fixture also shows slots in the base plate, fitting the long slots in the milling machine table to hold down the fixture, and two keys to align the fixture with the centerslot of the machine table.

For milling steel a large amount of coolant is constantly kept running over the work and cutters, and the milling machine table has a trough to carry the coolant back to a reservoir. When the fixture is wider than the machine table, a trough should be provided to hold the coolant and let it drain into the machine trough.

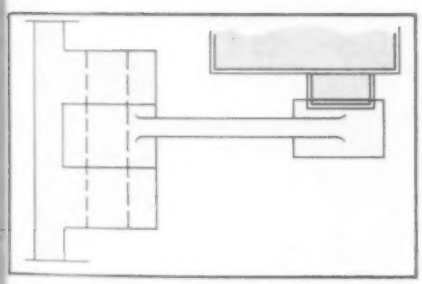


FIG. 16

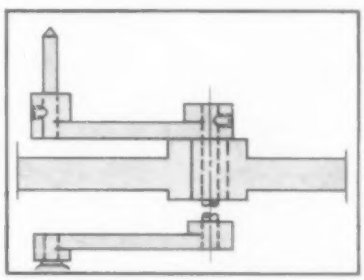


FIG. 17

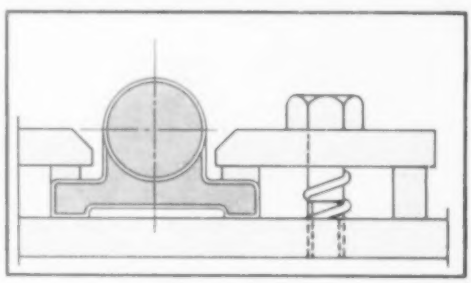


FIG. 18

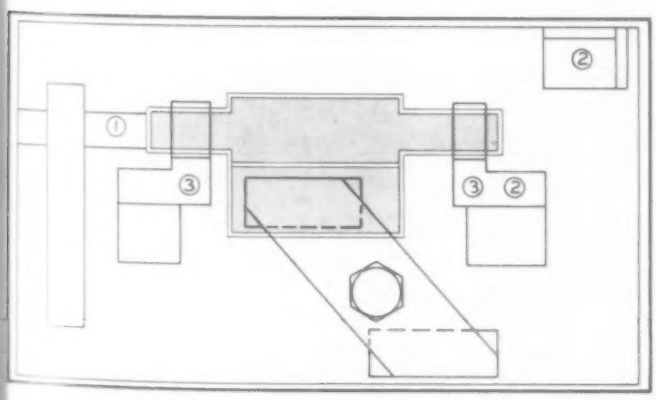


FIG. 19

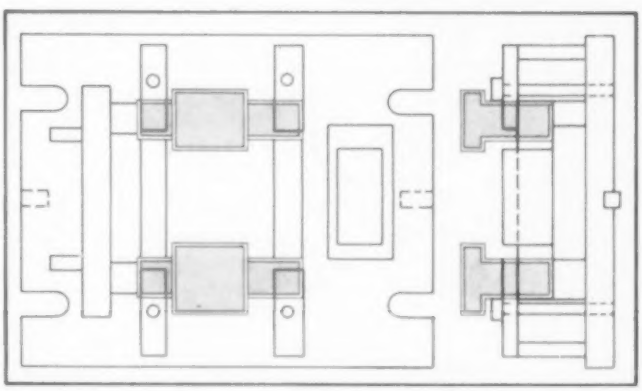


FIG. 20

designing for efficiency

By Clement F. Brown

Strap Type Welding Fixture

A LARGE CAST STEEL transition piece (a section of which is shown in Fig. 1) presented the problem of welding seven steel clips in the positions shown. It was desired that the fixtures locate the clips in such a manner that they could be completely welded at one setup. It was also important that the fixture be flexible enough to allow for slight irregularities in the casting. The only preparation given the casting was cleaning and the layout of the main centerline on the edge and outer surface. The clips were produced in a form and cutoff die from $\frac{1}{8}$ x $\frac{3}{4}$ in. flat stock.

The welding fixture developed for this job is shown in Fig. 2. The main body of the tool was made from a piece of 3/16 x $1\frac{1}{4}$ in. flat steel (part 1). This piece was formed to an inner radius 19 55/64 in., which conformed to the outer shape of the transition piece. At the center of the formed member a small Vee notch was cut in the edge. Seven stations were provided to locate the clips. The central station and those at the extremities of the tool were constructed as shown in section *A-A*. The locating block (Part 2) and the clamp block (Part 3) were located in the correct position by a socket head screw (Part 7) and two dowel pins (Part 5). Two dowel pins (Part 4) were pressed into the locating block and served to locate the clips along their stock width. The $\frac{1}{4}$" x 20 x $\frac{1}{2}$ in. long thumbscrew (Part 10) clamped the bent clips. The four intermediate stations as shown in section *B-B* were basically the same as the others. The only difference was the elimination of the clamp block (Part 8) and dowels (Part 6).

When setting up for production, the welder slipped the fixture on the casting, lining up the Vee notch with the laid-out centerline, and clamping in position with the three lower thumbscrews. Each of the seven clips was nested in position at each station, located between the two dowel pins and $\frac{1}{4}$ in. from the edge of the casting. Each clip was clamped in position by the upper thumbscrews. After welding the clips on three sides, all of which are easily reached, the fixture is removed by loosening the ten thumbscrews sufficiently to permit withdrawing from the weldment.

TABLE I—PARTS LIST FOR FIXTURE

PART NUMBER	NUMBER REQUIRED	STOCK SIZE	MATERIAL
1	1	Band 3/16 x $1\frac{1}{4}$ x $19\frac{1}{2}$	C. R. S.
2	7	Loc. Block $\frac{5}{8}$ x $1\frac{1}{2}$ x $2\frac{3}{8}$ lg.	C. R. S.
3	3	Clamp block $\frac{1}{2}$ x $1\frac{1}{4}$ x $1\frac{5}{8}$ lg.	C. R. S.
4	14	Dowel pin 3/16 diam x $\frac{5}{8}$ lg.	Std.
5	6	Dowel pin 3/16 diam x $1\frac{1}{4}$ lg.	Std.
6	8	Dowel pin 3/16 diam x $\frac{3}{4}$ lg.	Std.
7	3	Socket hd. screw $\frac{1}{4}$-20 x $1\frac{1}{4}$ lg.	Steel
8	4	Socket hd. screw $\frac{1}{4}$-20 x $\frac{7}{8}$ lg.	Steel
9	3	Thumb screw $\frac{1}{4}$-20 x $\frac{1}{2}$ long	Steel
10	7	Thumb screw $\frac{1}{4}$-20 x $\frac{3}{4}$ long	Steel

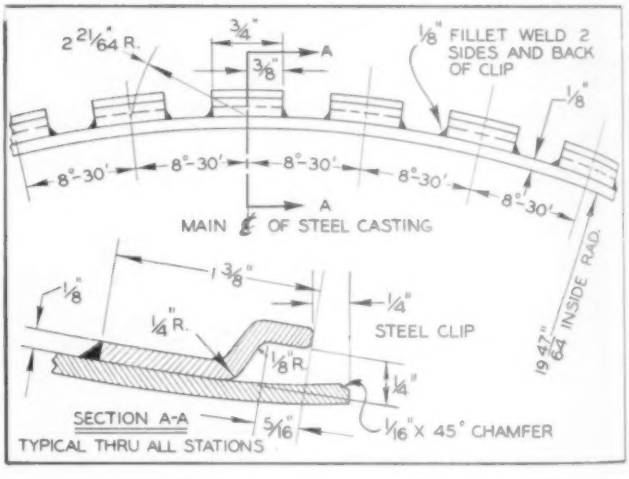
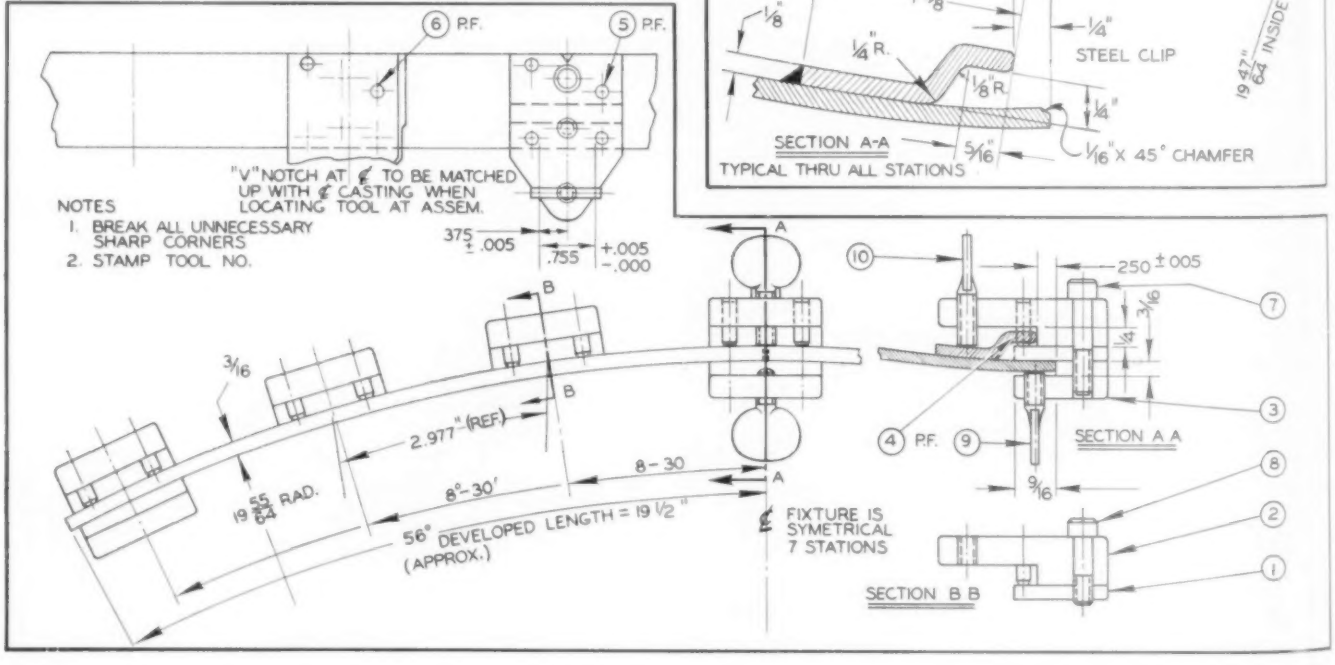


Fig. 1 (right) shows a section of the cast steel piece. Sections A-A and B-B, as well as the fixture used, are shown in Fig. 2 (below).



Buffing Ferrous and Non-Ferrous Metals

By Edward Engel

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BUFFING REMOVES LESS metal than polishing, therefore it seems incongruous to refer to buffing as a "cutting-down" operation. The latter term, however, is used to distinguish the performance from the "coloring" or color-buffing operation. The term "coloring" is so named because the true color of the metal is developed.

It is not economical to remove scratches by buffing, polishing operations are more effective. In contrast to polishing, the abrasives are not cemented to the wheel or belt in buffing. The abrasive and lubricant are combined in a stick, cake, paste or liquid and applied manually or semi-automatically at frequent intervals to the buffing wheel.

Selection of Buffing Wheels

The selection of a buff is dependent on the hardness of the metal, the shape of the work and the desired finish. (See Table I and II.) A cotton wheel is chosen by the closeness of the weave and the thread weight of the cotton. The closeness of the weave is designated as follows: The lengthwise threads are referred to as the warp, the crosswise threads are called filler threads. The number of warp and filler threads per inch is stated. The weight is computed as the number of lineal yards per pound.

The separate circular pieces or discs assembled to form the buff are so arranged as to their spacing to control the flexibility of the wheel. The soft, loosely woven, well spaced and widely sewed discs of unbleached materials are used as buffs for "coloring".

The range of "cutting-down" (buffing) operations and the types of buffs vary as follows:

Bleached sheetings generally form the disc, as this material is harder and firmer than unbleached cotton. Spiral, concentric, square and special styles of sewing also present different buffing results.

(1) Spiral-sewed buffs are the least in cost, but they vary in hardness; while concentric stitched buffs are of uniform hardness and are slightly harder than full disc buffs. The concentric type presents greater spacing range than spiral sewed buffs. Their wider range of spacing enables concentric buffs to be presented with soft to hard centers, affording a stiff wheel with a soft flexible face or alternatively flexible throughout. Therefore, the concentric buffs, depending on their flexibility, may be used either for cutting-down or coloring. Square-sewed buffs are harder than other types, but when sufficient pressure is used they are flexible enough for heavy cutting-down. Sewed-pieced-buffs are usually better than full disc buffs, although they are not as readily available.

Automatic buffing operations may require special sewed buffs. The latter are usually folded or puckered to form pockets on the periphery. The pockets retain buffing compounds, tend to run cool and have excellent flexibility as well as stiffness where it is desired.

Buffing wheels are operated on the same type of lathes as polishing wheels. Buffing wheels are balanced while rotating. Pumice stones are used for rough truing, but fine balancing requires a pipe and buffing compound. To ascertain the tolerance and balance of a buffing wheel, crook a finger and hold it lightly against the rotating wheeel.

Wheel Life

Wheels used in automatic buffing machines are usually of 14 in. diameter and have an operating life of about 12 hours. On an average the wheels must be cleaned off about every 25-30 pieces of work, and pumice is usually employed for this purpose.

Buffing Compounds: It is necessary to remove buffing compounds immediately, otherwise their removal may be difficult or even impossible. In some instances insoluble metallic soaps are formed by the reaction of the greases with the metal. (See Table I for Buffing Control Data.)

The abrasive compounds perform the buffing if applied in sufficient quantities. Too much compound is evidenced by its becoming attached to the metal.

Lubricants are used to limit the shearing action; too much shearing action will produce sufficient heat to discolor metal.

(1) Shearing stresses greater than the yield value of the metal will cause plastic flow in a solid substance. Aluminum and copper are particularly subject to such action, therefore these metals require greater lubrication. Another reason aluminum requires greater lubrication is that it has the highest coefficient of friction among metals. Too much pressure should not be applied when buffing aluminum, as clogging of the wheel occurs and the adhered particles

TABLE I—POLISHING AND BUFFING DATA

METAL or ALLOY	ROUGHING	GREASING	BUFFING (Cutting-Down)	COLOR-BUFFING (COLORING)
2S, 3S, 52S Aluminum	————	Felt, sheepskin 180 grit or flour emery	Tripoli-sewed muslin buffs; 8500-10,000 fpm	Silica-open muslin; 200 mesh; 7500-8000 fpm
Heat treatable aluminum	————	100-150 emery; glued rag wheel	same as above	same as above
Machined Aluminum	—— ——	same as above	same as above	same as above
Die cast aluminum	180 sewed buffs 6000-6600 fpm	200-tallow or beeswax felt 6000-6600 fpm	same as above	same as above
Cast aluminum	60-80 emery; no lubricant	100-200 glued rag wheel	same as above	lime or same as above
Rough Cast aluminum	36-46 emery; No lubricant	same as above	same as above	same as above
Brass Sheet	60 mesh emery; sewed buffs	180-200 felt, sheepskin 6800 fpm	stitched muslin 12,000 fpm	Loose leaf
Machined brass	same as above	same as above	same as above	same as above
Brass castings	60-80	150-180	————	————
Monel	9000 fpm	9000 fpm	12,000 fpm	————
Stainless steel	Alumina 60-80 7000-9000 fpm	100-200 grit alumina 7000 fpm	Al_2O_3 chrome 150 grit 10,000-11,000 fpm	200 grit Al_2O_3 or chrome 12,000 fpm
Commercial steel	80	100-150 grit	Bleached muslin 120-150 grit 7500 fpm	180 grit 8000 fpm
Steel castings	60-80 grit	120-180 emery	Emery cake	wire 0.004--0.010 in. wire brushed 450-600 rpm
Cast iron	same as above	same as above	same as above	————
Surgical instruments	—— ——	————	180-200 emery felt wheels	Tampico wheel Alumina
Cutlery	80	120	same as above	—— ——
Hardware	36-54	90	————	————
Brush-matte finish	Tampico wire wheel and machine oil paste			
Scratch brush	80-120	10-015 in. 180-240 2400 fpm		

Gold—Fine grade of hard rouge; finish with tripoli and oil.
Numbers indicate grit sizes of abrasives.

may scratch the work. It may be necessary at times to clean the wheel with kerosene to prevent clogging.

(2) Absorption: The binders in the abrasive compound must have the property of wetting the metal. Absorption of a solid by a solid may occur. Therefore, if a metal is buffed with a compound which is not kept sufficiently moist it may adhere too firmly to the work. In such an absorbed state, the compound cannot always be removed without spoiling the finish.

(3) Cohesion: The cohesion of the ingredients of buffing compounds must be sufficient to prevent crumbling or flying off the buff. Fluidity of the compound must be low enough to overcome centrifugal force at operating temperatures.

(4) Adhesion: The adherence of the compounds should be sufficient to enable them to stick to the buffs. This property also must be limited to prevent too great adherence to the work; otherwise the work will be smutted.

(5) The speeds of buffing wheels together with the pressures of the work against the buffs vary in different operations. The above factors necessitate different characteristics in buffing compounds. The higher pressures required in automatic buffing call for higher melting point compositions than needed for manually-applied pressures. Generally, lower periphery speeds require lower melting point compounds, as well as softer textures in the abrasives.

(7) Ease of compound removal is necessary as well as desirable if rejects are to be held to a minimum.

Lubrication

The lubricating constituents are as follows:

(1) Stearic acid, such as beef or mutton tallow, provides toughness to the compound. Stearic acid is saponifiable.

(2) Among other saponifiable natural materials with binder properties are the following waxes: Beeswax, Candilla, Japan and Carnauba. The foregoing waxes are hard but not brittle and have excellent cohesion properties. Carnauba is the hardest and has the highest melting point.

The synthetic saponifiable lubricants are: Stearaniline glycol esters, prophylene-glycol, laurate glyceryl esters, like glyceryl cleate and salts of sulfonated alcohol. Two percent of the latter material in a buffing compound, assures the removal of the compound from the buffed work upon immersion in a water solution.

Petroleum jelly provides lubrication and adhesive properties. Its cost is low, but removal from the work is more difficult than the binders listed above.

The removal of buffing compounds has been a major difficulty of platers; although in recent years compound manufacturers have minimized that aspect. Greaseless buffing compounds, in the main, consist of glue and abrasives. Their removal is easy, and in addition it is claimed that their use often eliminates one or more polishing operations.

The conventional method of applying buffing compounds to a wheel is in stick or cake form. Compounds are also available in liquid form. The application of the fluid compound requires a compressor, spray-guns, pressure regulator and a means for the manual or automatic control of the spray.

It is claimed that in some applications, liquid compounds increased buff wheel life up to 25 percent. The liquid compound is easily removed. Semi-automatic applicators may be used for applying stick buffing compounds in manual buffing operations.

Automatic Polishing or Buffing cannot be performed efficiently on some shapes, and allowances cannot be made for variations in surface roughness from one article to another, or on different parts of the same article. Manual operation, as contrasted to automatic procedures, is more costly on large volumes of small pieces, although it is more flexible. In many operations automatic operations followed by selective manual buffing offer maximum quality and efficiency.

TABLE II—CONTROL OF BUFFING RESULTS

AN INCREASE IN THE	RESULTS IN AN INCREASE IN			RESULTS IN A DECREASE IN		
	Cutting	Pitting	Cloudiness	Cutting	Pitting	Cloudiness
Buff hardness	X	X	X			
Melting point of binder		X		X		X
Buff speed	X	X	X			
Pressure of work on buff	X	X	X			

Increased hardness results from high thread count, close spirals or stitching, short stitches, few or no spacers between discs and few or no spacers between sections and high peripheral speed. Less pressure for aluminum than other metals.

TABLE III—OPERATION COMPARISONS OF POLISHING AND BUFFING WHEELS

FACTOR	Spiral sewed	Concentric sewed	Square sewed	Sewed and pieced	Woven cloth	Soft canvas	Walrus hide	Sheepskin, felt; irregular shapes	Full sewed disc
OPERATION	More effective in cutting than disc wheels	More uniform results than with spiral-sewed wheels	For heavy cutting down	For cutting down; low-cost wheel	Polishing brass, stainless, aluminum, bronze and rough steel castings	For heavy aluminum and brass	Polishing cutlery, silverware, high-carbon steels	Fine buffing of flatware, cutlery	Performance almost equal to spiral-sewed in effectiveness of cutting down

Leather-covered wood wheels perform grinding operations.

Walrus leather disc, full disc sheepskin for brass, steel cutlery.

Canvas disc, coarse abrasive polishing-out on castings, forgings and brass plumbing.

Cloth or canvas most used and most versatile for roughing-out to finishing.

Aluminum: The non-heat-treatable aluminum alloys, 2-S, 3-S and 52-S are supplied with one or two sides mill-bright. Special mirror finishes are also supplied. The degree of lustre is dependent upon the alloy and its hardness. Thus the relative brightness decreases in the following order: full-hard, fully annealed, three-quarters annealed, one-half hard and one-quarter hard.

Abrasive polishing and buffing, unless followed by electrolytic polishing or "Chemical-Polishing" does not present the ideal surface conditions for decorative anodizing.

In order to increase the uniformity and lustre of anodic coats which have not been electrolytically-polished, a dry or waxed rag buffing wheel is used. The resultant appearance, however, lacks the Dresden-china-like delicacy of anodic films which have been previously "Chemical-Polished". Also, buffing removes about 0.00007 in. or on an average 10 to 25 percent of the oxide film and creates an opaque, lacquer-like appearance.

Articles made from embossed aluminum sheet do not require abrasive polishing or buffing prior to "Chemical-Polishing". Therefore, items made from Alcoa's or Reynolds' embossed aluminum sheet will cost less and will appear more luxurious than those produced from conventional sheet or strip.

Also, aluminumware which has been decoratively indented by drop-stamp or hydraulic press operations may be "Chemical-Polished" without abrasive polishing or buffing. The result will be an article at less cost but with a superior appearance to articles with plane surfaces.

Brass: Mill finishes on brass are equivalent in smoothness and lustre to those supplied by the aluminum producers. In addition, the following mill finishes may be procured: bright dip, rolled, burnished, satin-finish, as-drawn finish as well as other finishes.

TABLE IV—SCRATCH BRUSH OPERATIONS FOR THE REMOVAL OF BURRS AND SCALE

FACTORS	PIPE ENDS-ID	STEEL TUBES	SHEET METAL	ALUMINUM CASTINGS	ALUMINUM Coarse (rough) Finishing	ALUMINUM Fine Finishing
Wire size (in.)	0.14	0.14	0.095	0.08 to 0.0118	0.015	0.002 to 0.005
Wheel size (in.)	Small	8	8	2 to 12	12	12
Arbor hole (in.)	3/8	1 1/4	1/2	1/4 to 1/2	6	6 or less
Speed (rpm)	20,000	30,000	3,000	1750	1750	450 to 700
Operation	Deburring	Deburring	Deburring	Deburring	Cutting-down	Smoothing

For scratch-brushing aluminum and brass use soft brass wire with lanolin emulsion or soluble oil as a lubricant; for zinc and cadmium use scratch brush with 0.003 to 0.009 in. wire at 3000 to 6000 rpm. Steel wire presents more lustrous finishes on aluminum than does brass wire.

Brass is about the easiest metal to polish and buff, but it discolors rapidly unless properly protected.

Nickel-Plate: A high buff closes the pores of nickel-plate and provides increased corrosion resistance. Nickel deposited from "bright-nickel" baths may be color-buffed with very little loss of metal. But deposits from dull-nickel baths require buffing which may cause a loss of from 3 to 10 percent of the thickness.

Steel particularly, requires a high buff prior to plating. No. 3 grade, cold rolled, basic rimming steel responds best in buffing and plating. It has a surface of approximately 12 microinches. In ordinary times mirror-finished steel coils may be obtained at an increase in price ranging from 130 to 200 percent, dependent on their surface smoothness which ranges from 5 to 1 microinches.

Stainless Steel: The heavier gages are not supplied in lustrous finishes. The lighter gages are mill finished as follows:

No. 2B or No. 2D are the usual finishes obtained from the mill.

No. 4 finish may be purchased or the fabricator may polish No. 2B or No. 2D by using the steps as follows: (1) 80-100 grit, either dry or with a slight amount of cutting-oil; (2) 120 grit and tallow and (3) 150 grit and tallow.

No. 7 finish may either be produced at the mill or by the fabricator. The operation sequence on 2B or 2D finishes are as follows: Nos. (1), (2), (3) steps are the same as for the No. 4 finish; the 4th step uses 180 grit, the 5th step 220 grit and the 6th step uses 320 grit.

No. 8 finish requires the 7th step with 420 grit.

No. 9 finish requires a buffing operation in addition to the polishing sequences used in producing the No. 7 finish.

Stainless steel is a poor conductor of heat and large quantities of tallow are needed in all buffing operations. The abrasive may be one of the following: aluminum, chromic oxide, rouge or silicon carbide. An excessive application of abrasives causes cloudiness on the work.

Buffs for stainless steel usually have a thread count of 64/48. The wheel diameters range from 6 to 14 in. with about 4½ in. faces, operating at peripheral speeds of 5,000 to 8,000 ft.

Wire (Scratch) Brushing on aluminum, for example, utilizes a 10 in. diam wheel, and 0.015 in diam wires (of brass, nickel, stainless or nickel-silver) for coarse work, but 0.002 to 0.005 in. wires are used to obtain a satin finish. The rotation of the wheel may be reversed to achieve various effects. Wheel speeds for scratch-brushing wrought aluminum alloys are around 2,000 rpm, and on castings the range is from 450 to 600 rpm.

Thread-Rolling Trouble Check List

Trouble	Flat-die rolling	Cylindrical-die rolling
Slivers or flakes	1. Dies not in match, or 2. Tipped start, or 3. Deep cross-nicking on dies, or 4. Slipping at start, or 5. Improper helix angle on dies, or 6. Machine and dies too large and clumsy for the job	1. Dies not in match, or 2. Crooked feeding
Drunken threads	1. Dies not in match, or 2. Tipped start, or 3. Crooked relief on dies, or 4. Slipping at start, or 5. Improper helix angle on dies, or 6. Inaccurate dies	1. Dies not in match, or 2. Crooked feeding, or 3. Inaccurate dies
Offsize threads		
1. PD and OD both oversize	Oversize blanks	Oversize blanks
2. PD oversize, OD right size	Oversize blanks. If finished thread is full, die thread is too shallow	Oversize blanks. If finished thread is full, die thread is too shallow
3. PD oversize, OD undersize	Insufficient squeeze on dies. If finished thread is full, die thread is too shallow	Insufficient squeeze on dies. If finished thread is full, die thread is too shallow
4. PD right size, OD oversize	Blank too large. Die thread deeper than necessary	Blank too large. Die thread deeper than necessary
5. PD right size, OD undersize	Blank too small. If finished thread is full, die thread is too shallow	Blank too small. If finished thread is full, die thread is too shallow
6. PD undersize, OD oversize	Too much squeeze. Die thread deeper than necessary	Too much squeeze. Die thread deeper than necessary
7. PD undersize, OD right size	Blank too small. Die thread deeper than necessary	Blank too small. Die thread deeper than necessary
8. PD and OD both undersize	Blank too small	Blank too small
Out of round	1. Out-of-round blank, or 2. Too much pressure on finish end of dies, or 3. Poor thread form on the relief of the die, or 4. Dies too short for the job, or 5. If thread is full on one side and not on the other, poor match or crooked start	1. Out-of-round blank, or 2. Crooked feeding, or 3. Too rapid penetration and release
Taper		
1. PD straight, OD tapered and not filled out on small end	Tapered blank	Tapered blank
2. PD and OD both tapered same way	Tapered blank, and dies set up with taper to match	Tapered blank, and dies set up with taper to match
3. PD and OD tapered in opposite directions and thread not filled out on end with small OD	Dies not squeezed tight enough on edge with large PD and small OD	Dies not squeezed tight enough on edge with large PD and small OD
Thread with expanded lead	Expanded lead in the dies	Expanded lead in the dies
Thread with contracted lead	1. Contracted lead in dies 2. Hard material (Rockwell 18-C scale and harder) will contract slightly when released from rolling dies. For accurate work, use dies with expanded lead	1. Contracted lead in dies 2. Hard material (Rockwell 18-C scale and harder) will contract slightly when released from rolling dies. For accurate work, use dies with expanded lead

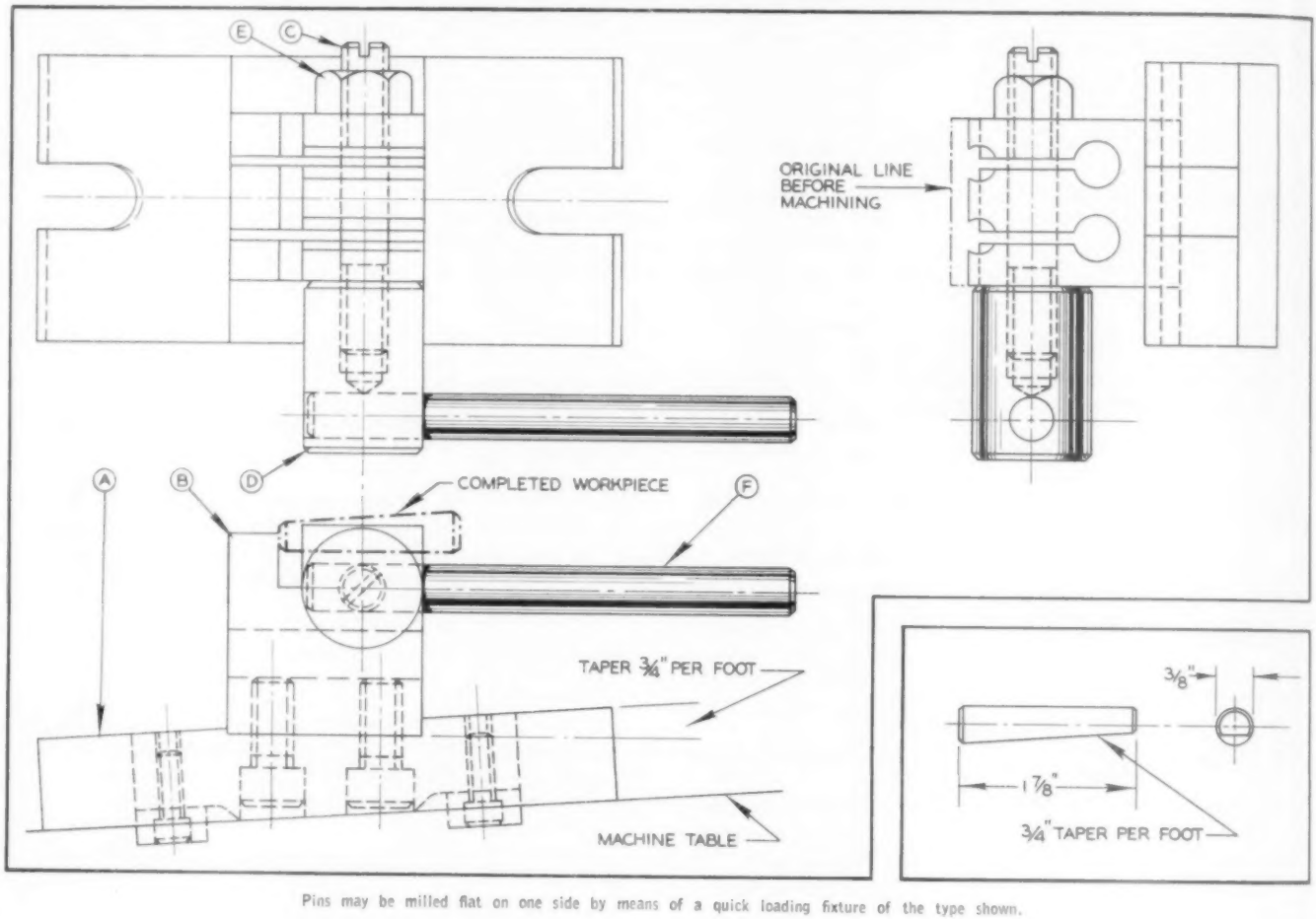
Trouble	Flat-die rolling	Cylindrical-die rolling
Poor thread form	1. Poor thread form in the dies, or 2. Dies not in match, or 3. Crooked start, or 4. Machine and dies too large and clumsy for the job	1. Poor thread form in the dies, or 2. Dies not in match, or 3. Crooked feeding
Line running axially down one side	1. Insufficient relief on the stationary die and too much pressure on the finish end, or 2. Not gradual enough release of pressure at finish end, or 3. Dies too short for the job	
Thread filled out in center but not at ends, or vice versa	1. Face of die not flat, or 2. Blank with varying diameter from end to end	1. Die with varying diameter from end to end, or 2. Blank with varying diameter from end to end
End threads not filled out	This is characteristic of thread rolling but can be minimized by beveling ends of blanks	This is characteristic of thread rolling—but can be minimized by beveling ends of blanks. Can be somewhat improved by longer, slower penetration cycle
Split screw	1. Seamy stock, or 2. Too much pressure on dies, usually at finish end, or 3. Dies too short for the job	1. Seamy stock, or 2. Too much pressure on dies
Poor finish on screw	1. Correspondingly poor finish on dies, or 2. Dies that are worn out or broken, or 3. Dies not in match, or 4. Slipping, or 5. Deep cross-nicking on start	1. Correspondingly poor finish on dies, or 2. Dies that are worn out or broken, or 3. Dies not in match
Crests not filled out. Many users do not consider this a serious objection, and by allowing their screws to pass with crests not filled out, overloading of dies is avoided and die life is prolonged	1. Blank too small, or 2. Die thread too deep	1. Blank too small, or 2. Die thread too deep. Can be somewhat improved by longer, slower penetration cycle
Scuffed crests (two-cylindrical-die type only)		1. Rough work support blade 2. Soft work support blade 3. Improper oiling
Hollow work, hole closes in		1. Needs supporting arbor 2. Penetration rate too rapid
Hollow work, hole enlarged		1. Arbor too tight 2. Penetration rate too rapid 3. Blank too large on OD
Hollow work, out of round		1. Penetration rate too rapid 2. Too little dwell with dies fully closed 3. Too rapid opening of die
Hollow work, tapered thread due to uneven wall thickness or support from an adjacent section		1. Improper arbor, not giving support where needed 2. Penetration rate too rapid 3. Taper of dies not great enough to compensate for tendency of work to taper

From the Tool Engineers Handbook, ASTE, 1949.

GADGETS

Ingenious Devices and Ideas to Help the Tool Engineer in His Daily Work

Quick Clamping Fixture Simplifies a Milling Problem



Pins may be milled flat on one side by means of a quick loading fixture of the type shown.

As a general rule, the simpler the construction of a jig or fixture, the more efficient its operation. And while it is sometimes more difficult to design a simple tool than a complicated one, the extra thought and study so expended usually pays off in reduced tool and production costs. Such was the case when it came to designing a milling fixture for the part shown in Fig. 1, a lock pin extensively used in the manufacture of farm equipment. The pin, made from 3/8 in. diameter SAE 1112 cold drawn steel, has a taper flat filled along its entire length.

At first thought, it would seem that designing a milling fixture for this part would be an easy matter. Nevertheless, it presented a problem. The part is small, making it hard to hold securely; it is a high production item, necessitating rapid clamping and unloading; and it has to be held so that accuracy can be maintained with rejection held to a minimum. After several complicated designs had been considered and rejected, the simple fixture shown in Fig. 2 was finally accepted. Despite some initial doubts, it worked admirably.

A base plate "A", made of machine steel and keyed for table T-slots, has a crosswise slot milled at an angle corresponding to the 3/4 in. per foot taper on the workpiece. On this is mounted a tool steel block—"B"—which, after machining, is hardened and drawn spring temper. Two 3/8 in. in diameter holes are reamed side-by-side in parallel and the top is then slabbed off, as indicated by the dotted lines, to leave partial holes. To provide spring, these holes are connected by slots to two larger holes near the bottom of the block.

A clearance hole is drilled part way through the block, and tapped at the opposite end, to receive stud "C". This provides adjustment for clamping tension so that, when clamping nut "D" is drawn up, the handle "F" will lie parallel to the machine table. The stud is locked with a jam nut, "E".

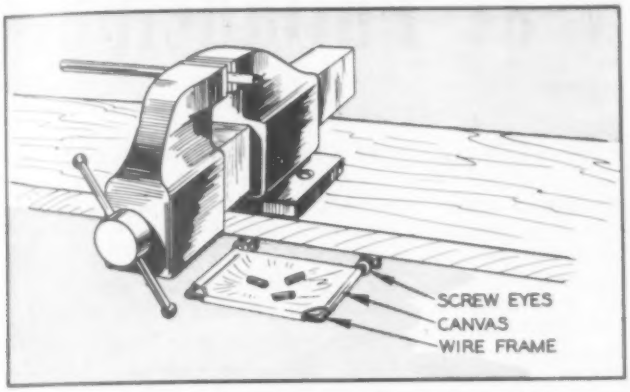
In use, the operator merely slips the pins into the two sectional holes and against the stop, and brings the handle down an approximate quarter turn to clamp two parts. In addition to being fast acting and easy to operate, the fixture produces interchangeable parts even with unskilled help.

Roger Isetts,
Kenosha, Wis.

The Tool Engineer pays regular page rates for accepted contributions to these pages, with a minimum of $5.00 for each item.

"Hammock" Catches Parts

When sawing off short pieces of drill rod or screw stock in a bench vise, the workman must either hold or catch the sawn-off stub with one hand during the last few strokes or risk having them fall to the floor, with possible loss. In any event, the workman is slowed up. A "hammock" device, such as illustrated, will catch the parts and hold an accumulation in addition to permitting the workman to saw the stock through, using both hands. Thus, it expedites sawing and prevents loss.



Sawed-off parts fall into canvas tray at side of bench vise.

The device consists of a U-frame of heavy wire, the two legs of which slide in four screw eyes screwed into the bottom of the bench. The ends of the legs are bent over to act as stops. The "hammock" is made of a suitable, strong twill material, hemmed on three sides to slip with baggy looseness over the U-frame. The third side is tacked to the bottom of the bench. The device should be placed to the right of and, naturally, below the vise. When not in use, it can be slid under the bench, the fabric permitting easy telescoping.

Fabric is recommended because it is easily dusted and does not mar the work. A metal tray could be used, to swing in or out, but there would be a tendency for small parts to bounce out when hitting the metal. The fabric arrests such bouncing.

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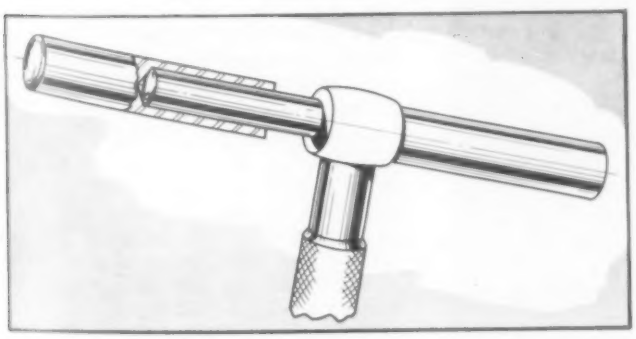
London, England

Telescope Gage Extension

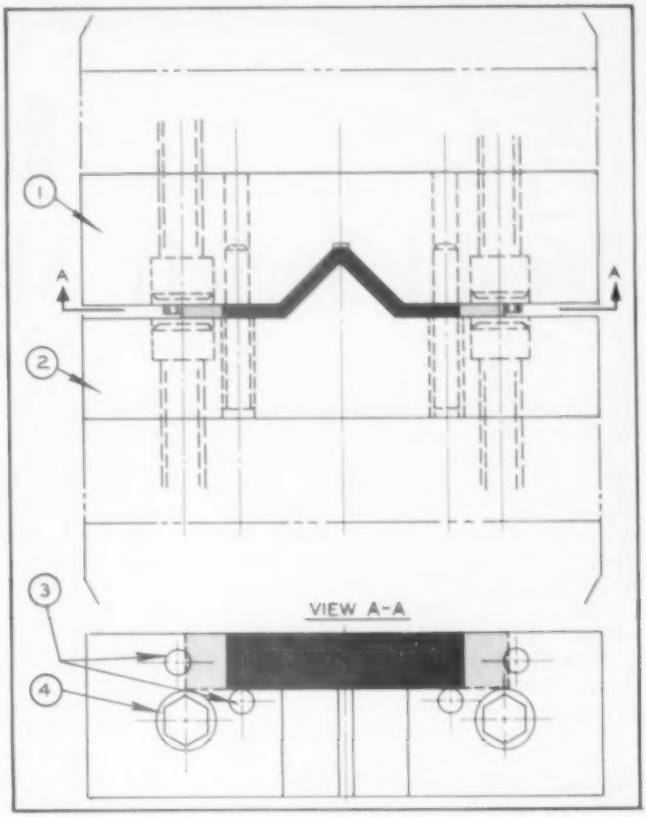


Telescope gages may be extended by slipping a sleeve over one of the contacts.

When a telescope gage is too short to span a bore, it may be extended by means of a sleeve, as illustrated. Should extra length be required, it may be further extended by inserting a slug between the sleeve and the telescoping contact.

George Hull
Detroit Chapter, ASTE

Forming Vise Jaws



Forming jaws, fitted to a bench vise, may be used to bend comparatively simple shapes on short production runs.

Time and money may be saved on short-run bending of soft stock—aluminum, copper, brass—by means of forming jaws fitted to a common bench vise. Simple to make and somewhat less expensive than conventional dies, the device also obviates the use of an expensive punch press. The part shown in place may be considered typical of many shapes that may be formed.

Details 1 and 2 are made of cold drawn steel and, if so desired, may be case hardened. Allowance should be made for spring-back of material. Details 3 and 4 are, respective, locating pins and screws, the latter for attaching the jaws to the vise.

The pins are preferably made of drill rod, drive fit in the fixed jaws and clearance through the moveable jaw. The blank—outlined in black—is located between the end pins, as suggested by the shaded section, and rests on the lower pins. Extending the pins as far as possible through the moveable jaw will prevent the blank falling through the jaws when loading.

Frank J. Peragine,
Chapter 34, ASTE

To Oil Inaccessible Places

Rest the end of a wire or thin rod against the spot to be oiled and apply the oil along the length of the wire in small amounts. The oil will run down to the tip and into the spot to be oiled in the amount desired instead of drenching the surrounding area. For more delicate oiling, dip the wire into the oil, and then apply as needed. A cotton swab, such as is used in medical practice, is also handy for covering hidden areas with a light film of oil; for that matter, it can also be sprayed on.

Arthur P. Christensen
Lockport, N. Y.

Early Sellout Predicts Record Society Show at Philadelphia

Nearly 270 Exhibitors Take 86 Percent of Space During First 60 Days

EIGHTY-SIX percent sold out 60 days after announcement! That's the record hung up by the 1950 Tool Engineer's Industrial Cost-Cutting Exposition. At press time 267 firms (listed in later pages) had contracted for space to display their contributions to more efficient and less costly industrial production. And applications are still coming in at ASTE headquarters.

This unprecedented demand for space in the Society's eighth exposition, which runs from April 10 through 14, stamps the ASTE show as a sales-getter.

Among reasons why exhibitors "want in" are: (1) recognition that industry considers 1950 a major buying year for cost-cutting equipment, indicated in the ASTE survey published in the December Tool Engineer; (2) ability of ASTE shows to draw top-buying-influence men from industry on an international scale; and (3) need of most industrial equipment manufacturers to bolster short-handed sales staffs by bringing the customer to the product.

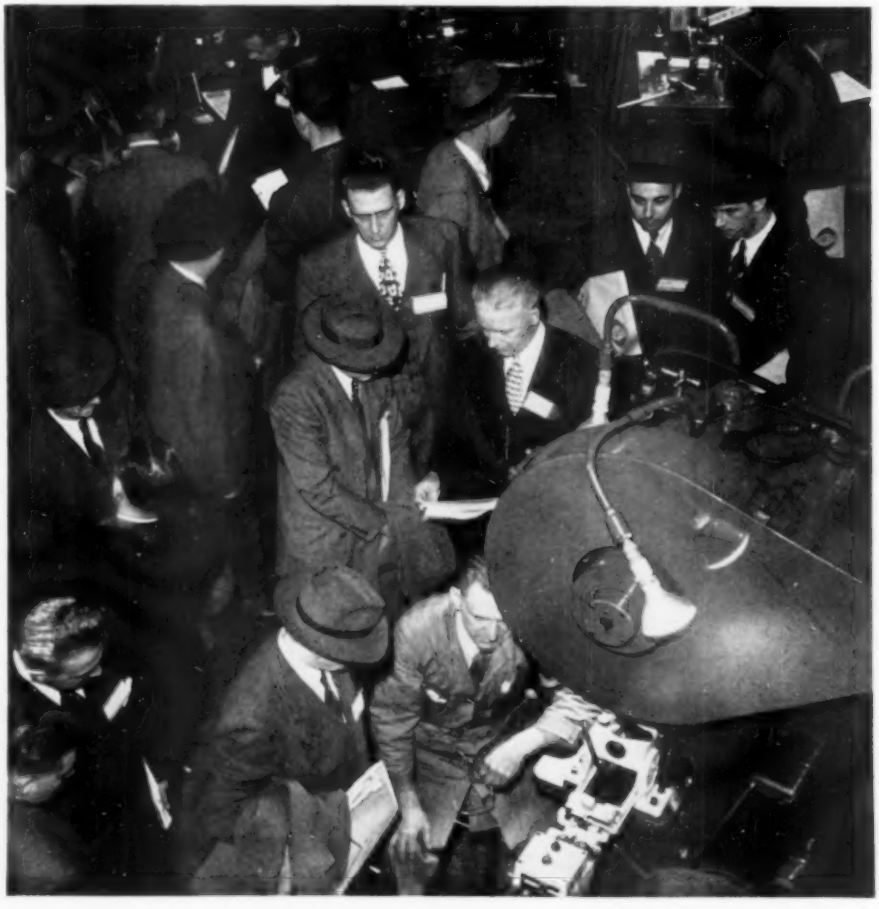
In its new site at the Philadelphia Convention Hall and Commercial Museum, the 1950 show offers attractive facilities to exhibitors and visitors. Both halls are on the entrance floor, eliminating tiresome stair climbing. Layout of the buildings makes it possible to increase exhibit space if advisable.

A post office, Western Union office and complete telephone facilities are available. One of the outstanding services is a restaurant equipped with permanent kitchen facilities and serving excellent food at reasonable prices.

Only a short cab ride from most hotels, the exposition buildings are served by bus lines and flanked by free parking lots.

In a motion picture theater adjoining these buildings, a selection of recent industrial film releases will be shown.

Rooms for the concurrent technical sessions on another floor are accessible by elevator and furnished with comfortable, leather upholstered chairs.



Visitors to the 1950 ASTE show at Philadelphia will see for themselves how new and improved production equipment can reduce manufacturing costs.

Heart of Major Industrial Area

Strategically located, Philadelphia has within a 100-mile radius: 14 percent of the nation's population and 26 percent of the number of manufacturing establishments. This largest concentration of population and business in a comparable area covers only one percent of the land area of the country but includes the entire states of Delaware and New Jersey, important sections of Maryland, New York and Pennsylvania and three of the largest cities in the United States—New York, Philadelphia and Baltimore.

The 20 million people within this area produce $12 billion worth of goods annually.

Hotel accommodations to take care of the crowds expected are another advantage of the Philadelphia location. Reservations are being handled by: Housing Bureau, American Society of Tool Engineers, 17th and Sansom Sts., Philadelphia 3, Penn. Telephone is LOcust 4-2251.

An estimated 30,000 visitors will register, topping previous figures by about 50 percent. Admittance will be by invitation. Registration still is only $1.00. Registrants may visit the show throughout the five days and participate in the technical sessions and plant tours conducted in conjunction with the 18th annual meeting of the Society.

Beginning Monday afternoon approximately 25 speakers will present the 15 scheduled technical sessions.

Highlight of the speaking program is an economic forum Monday evening, when a group of leading industrial economists will debate industry's future in the United States. Dr. Edwin G. Nourse, former chairman of President Truman's Economic Board, will head the forum.

Joseph S. Hildreth, president of Chil-

ton Publishing Co., is chairman of the committee arranging for this major event. Serving with him are E. L. Shaner, chairman and treasurer, Penton Publishing Co., and Robert B. Luchars, president, The Industrial Press.

Five hundred of the 3000 seats at the Academy of Music will be reserved for industrial leaders to be invited from all over the country. No manufacturing executive can afford to miss this momentous meeting. It could well predict the destiny of the free enterprise system.

Subjects Cover Wide Field

Tentative technical program for the five days follows: Monday afternoon, Developments in Pressworking; Tuesday, Hard Surfacing of Production Tools and Gages, Automation, Design and Use of Diecasting Dies, Machinability, and Cost Estimating. Wednesday, Cold Extrusion of Metals, Cold Roll Forming of Metals, Machining of High-Temperature Materials, Modern Metal Cutting in Theory and Practice.

Thursday, Broaching Applications for Cost Reduction, and Automation; Friday, Trends in Drilling, and Investment Casting.

Thursday evening is reserved for the 18th annual banquet and membership meeting.

This program was developed in a meeting of the National Program Commitee and the host chapter at Philadelphia, December 9 and 10.

F. J. Schmitt, national program chairman, conducted the meeting attended by: G. A. Rogers, first vice-chairman, Gardner Young, second vice-chairman, and J. O. Horne, secretary, H. E. Conrad, executive secretary of the Society, and F. W. Wilson, technical director, both from ASTE headquarters, K. W. Riddle, Philadelphia member of the National Program Committee, and National Director T. J. Donovan, Jr., also of Philadelphia.

Riddle Named General Chairman

Mr. Riddle heads the local committee as general chairman with R. S. Paulsen as assistant general chairman.

Members of the National Program Committee will co-ordinate various phases of convention activity as follows: Technical: co-ordinator, Mr. Rogers; chairman, Mr. Paulsen; assistant chairman, T. A. McMillan; plant tours, D. H. Renfrew; transportation, W. J. Stevens; meetings and arrangements, D. J. Heckinger; and signs, E. A. Lund.

Arrangements: co-ordinator, J. O. Horne; chairman, H. W. Gross; assistant chairman, A. R. Diamond; publicity, W. J. Griffith; activities tickets, Clarence Duffany; registration and emergencies, S. R. Boyer; motion pictures, H. D. Wood; accommodations, F. M. Crayton; entertainment, W. S. Chalfant.

Social program: co-ordinator, Gardner Young; chairman, Emil Kitzman; assistant chairman, W. R. Phifer; banquet, C. K. Lennig, Jr.; reception, P. A. Patterson; budgets, chairman, F. J. DeFrates; records and reports, chairman, Byron Gates and assistant chairman, J. F. Barnes.

Toledo Chapter Sponsors Scholarship at U. of T.

Toledo, Ohio—A $200 scholarship awaits a junior or senior in the mechanical or mechanical industrial curriculum of the University of Toledo. The award is being offered by Toledo chapter, ASTE, to a qualifying student interested in tool engineering as indicated by his study program. The winner will be selected from applications on file in February.

A cash award of $50 will be presented at the annual installation dinner in March and the remaining $150 will be applied on tuition.

Serving on the selection committee are: Dean Brandeberry of the university, N. J. Kirk, works manager, E. W. Bliss Co., R. B. Haynes, works manager, Spicer Mfg. Corp., Div. Dana Corp., A. L. Baker, president, Baker Brothers, Inc., and R. A. Langenderfer, process engineer, The DeVilbiss Co. and chairman of the chapter Education Committee.

Heavy-Machinery Plant Host to New Haven Group

New Haven, Conn.—Heavy machine manufacturing methods were demonstrated for 84 members and guests of New Haven chapter, November 10, in a tour of the Farrel-Birmingham plant at Ansonia.

Company officials and foremen escorted the engineers in groups of 12 through the pattern shop, foundry, metallurgical laboratory, machine, erecting and roll shops. The heavy equipment used in making big machinery manufactured by the firm was of unusual interest.

Dinner and a technical session at the Ansonia YMCA preceded the tour. Bernard Didsbury, technical chairman, introduced the speaker of the evening, Edward S. Coe, manager of the Farrel-Birmingham plant. After explaining the problems of a factory in the center of a town, with no room for expansion, Mr. Coe described departments to be inspected at the plant.

ASTE, SAE Students Hear Hydraulics Talk

Indianapolis, Ind.—Approximately 300 members of the ASTE and SAE student groups at Purdue University, Lafayette, met jointly December 6 at the Union Club of the university.

Professor Halsey F. Owen, third vice-president of ASTE, introduced the speaker, Robert M. Schaefer, chief commercial engineer, Allison Div. of General Motors.

In a semi-technical manner Mr. Schaefer discussed earlier research on hydraulic transmissions and the application of hydraulic drives to such equipment as automobiles, trucks, tanks and electric interurban cars.

The students questioned the speaker for nearly an hour following his talk.

Visitors included Howard W. Curfman, chairman of the parent Indianapolis ASTE chapter, a delegation of chapter members, and Frank W. Wilson, technical director of the Society.

Detroit Sees Production Forging in Auto Plant

Detroit, Mich.—Six-ton steam hammers banging out 85-pound crankshafts and relatively small presses forming bearing caps weighing only a few ounces contrasted extremes in forging operations for approximately 250 Detroit members and guests who visited the Chevrolet Forge Division plant recently. D. B. Muirhead, plant manager, was host for the tour, conducted in small groups by company guides.

In four and one-half hours, the engineers found, this modern plant can transform a steel billet into crankshafts.

Among other forgings viewed by the members were springs, bumpers, brackets, gear blanks and axles. Daily output of the plant is 26 box cars of finished forgings.

Dinner at Gear and Axle Plant No. 4 and a welcome by Mr. Muirhead preceded the tour. At the end of the trip the plant manager conducted a question and answer period in the conference room of the personnel building.

Dusseau, General Manager

Toledo, Ohio—Roy Dusseau, second vice-chairman of Toledo chapter, ASTE, has been appointed general manager of the Meisel Machine & Tool Co., according to a recent announcement.

Mr. Dusseau was formerly president and owner of Dusseau Die Service Co.

Other News in This Issue

Exhibitors

1950 TOOL ENGINEER'S INDUSTRIAL COST-CUTTING EXPOSITION

ACCURATE BUSHING CO.
Garwood, N. J.

ACE ABRASIVE LABORATORIES
New York, N. Y.

ACME STEEL CO.
Chicago, Ill.

ACME TOOL CO.
New York, N. Y.

ACME WINTER CORP.
Buffalo, N. Y.

AJAX ELECTRIC CO., INC.
Philadelphia, Penn.

THE ALLEN MFG. CO.
Hartford, Conn.

ALLIED PRODUCTS CORP.
Detroit, Mich.

ALLISON CO.
Bridgeport, Conn.

AMERICAN MACHINE & FOUNDRY CO.
Wahlstrom Tool Div.
Brooklyn, N. Y.

AMPCO METAL, INC.
Milwaukee, Wis.

F. E. ANDERSON OIL CO.
Portland, Conn.

ANDERSON & SONS, INC.
Westfield, Mass.

R. B. ANNIS CO.
Indianapolis, Ind.

ARMSTRONG BROS. TOOL CO.
Chicago, Ill.

THE ARO EQUIPMENT CORP.
Bryan, Ohio

ATLAS PRESS CO.
Kalamazoo, Mich.

AUSTENAL LABORATORIES, INC.
New York, N. Y.

AUTOMOTIVE INDUSTRIES
Chilton Company
Philadelphia, Penn.

W. O. BARNES CO., INC.
Detroit, Mich.

BAUSCH & LOMB OPTICAL CO.
Rochester, N. Y.

BAY STATE ABRASIVE PRODUCTS CO.
Westboro, Mass.

BEAVER TOOL & ENGINEERING CORP.
Royal Oak, Mich.

THE BELLOWS CO.
Akron, Ohio

BENDIX-WESTINGHOUSE AUTOMOTIVE AIR BRAKE CO.
Elyria, Ohio

CHARLES H. BESLY & CO.
Chicago, Ill.

BLACK DRILL CO.
Cleveland, Ohio

EDWARD BLAKE CO.
West Newton, Mass.

HENRY P. BOGGIS & CO.
Cleveland, Ohio

BOICE-CRANE CO.
Toledo, Ohio

BOYAR-SCHULTZ CORP.
Chicago, Ill.

THE BRAMSON PUBLISHING CO.
Detroit, Mich.

BRIDGEPORT MACHINES, INC.
Bridgeport, Conn.

THE BRINNELL CO.
Granby, Conn.

BROWN & SHARPE MANUFACTURING CO.
Providence, R. I.

CHARLES BRUNING CO., INC.
Chicago, Ill.

CADILLAC GAGE CO.
Detroit, Mich.

CADILLAC STAMP CO.
Detroit, Mich.

CAMPBELL MACHINE DIV.
American Chain & Cable Co., Inc.
Bridgeport, Conn.

CARBOLOY COMPANY, INC.
Detroit, Mich.

CHICAGO RIVET & MACHINE CO.
Bellwood, Ill.

CHROME ELECTRO-FORMING CO.
Detroit, Mich.

CHRYSLER CORP.
Amplex Div.
Detroit, Mich.

CIRCULAR TOOL CO., INC.
Providence, R. I.

CITIES SERVICE OIL CO.
New York, N. Y.

COLONIAL BROACH CO.
Detroit, Mich.

COMMANDER MFG. CO.
Chicago, Ill.

CONOVER-MAST PUBLICATIONS, INC.
New York, N. Y.

ARTHUR A. CRAFTS CO., INC.
Boston, Mass.

C. C. CRALEY MFG. CO.
Shillington, Penn.

F. M. CRAYTON CO.
Philadelphia, Penn.

CRUCIBLE STEEL CO. OF AMERICA
New York, N. Y.

CRYSTAL LAKE GRINDERS
Crystal Lake, Ill.

THE CUSHMAN CHUCK CO.
Hartford, Conn.

DAKE ENGINE CO.
Grand Haven, Mich.

DANLY MACHINE SPECIALTIES, INC.
Chicago, Ill.

DCMT SALES CORP.
New York, N. Y.

O. F. DECASTRO & ASSOC.
Huntington Park, Calif.

DELAWARE TOOL STEEL CORP.
Wilmington, Del.

DENISON ENGINEERING CO.
Columbus, Ohio

DETROIT BROACH CO., INC.
Detroit, Mich.

DETROIT POWER SCREWDRIVER CO.
Detroit, Mich.

DETROIT STAMPING CO.
Finished Products Div.
Detroit, Mich.

DIAMOND DETROIT, INC.
Detroit, Mich.

THE DOALL CO.
Des Plaines, Ill.

DONOVAN CO.
Philadelphia, Penn.

THE DUMORE CO.
Racine, Wis.

EASTMAN KODAK CO.
Industrial Optical Sales Div.
Rochester, N. Y.

ELGIN NATIONAL WATCH CO.
Industrial Products Div.
Aurora, Ill.

ENCO MFG. CO.
Chicago, Ill.

ENGINEERS SPECIALTIES DIV.
Universal Engravers & Colorplate Co., Inc.
Buffalo, N. Y.

ENGIS EQUIPMENT CO.
Chicago, Ill.

ERICKSON STEEL CO.
Cleveland, Ohio

ERRINGTON MECHANICAL LAB., INC.
Staten Island, N. Y.

ETTCO TOOL CO., INC.
Brooklyn, N. Y.

EUGENE DIETZGEN CO., INC.
New York, N. Y.

EVEREDE TOOL CO.
Chicago, Ill.

EX-CELL-O CORP.
Detroit, Mich.

FALCON TOOL CO.
Detroit, Mich.

FEDERAL PRODUCTS CORP.
Providence, R. I.

FEN MACHINE CO.
Euclid, Ohio

FERGUSON MACHINE & TOOL CO., INC.
Ferguson, Mo.

FIDELITY TOOL SUPPLY
Camden, N. J.

FLODAR CORP.
Cleveland, Ohio

FONDA GAGE CO.
Stamford, Conn.

GAIRING TOOL CO.
Detroit, Mich.

GALE FORSSEN CO.
Springfield, Mass.

THE GAMMONS-HOAGLUND CO.
Manchester, Conn.

GARDNER PUBLICATIONS, INC.
Cincinnati, Ohio

GEROTOR MAY CORP.
Baltimore, Md.

GIDDINGS & LEWIS MACHINE TOOL CO.
Davis Boring Tool Div.
Fond du Lac, Wis.

GODDARD & GODDARD CO.
Detroit, Mich.

THE GOVRO-NELSON CO.
Detroit, Mich.

GRIFFITH-RAGUSE & CO., INC.
Philadelphia, Penn.

F. T. GRISWOLD MFG. CO.
Wayne, Penn.

GROBET FILE CO. OF AMERICA, INC.
New York, N. Y.

HAMILTON MFG. CO.
Two Rivers, Wis.

HAMMOND MACHINERY BUILDERS INC.
Kalamazoo, Mich.

HANDY & HARMAN
New York, N. Y.

HANNA ENGINEERING WORKS
Chicago, Ill.

HANNAFIN CORP.
Chicago, Ill.

HARDINGE BROTHERS, INC.
Elmira, N. Y.

R. G. HASKINS CO.
Chicago, Ill.

HAUSER MACHINE TOOL CORP.
Manhasset, N. Y.

HAYNES STELLITE CO.
New York, N. Y.

THE HEIM CO.
Fairfield, Conn.

HITCHCOCK PUBLISHING CO.
Wheaton, Ill.

THE E. HORTON & SON CO.
Windsor Locks, Conn.

HUEBNER PUBLICATIONS
Tool & Die Journal
Cleveland, Ohio

HY-PRO TOOL CO.
New Bedford, Mass.

IDEAL INDUSTRIES, INC.
Sycamore, Ill.

INDEX MACHINE CO.
Jackson, Mich.

INDUSTRIAL DIAMOND ASSN. OF AMERICA, INC.
New York, N. Y.

THE INDUSTRIAL PRESS
Machinery Magazine
New York, N. Y.

INGERSOLL-RAND CO.
New York, N. Y.

INSTITUTE OF INDUSTRIAL LAUNDERERS, INC.
New York, N. Y.

THE IRON AGE
New York, N. Y.

J & S TOOL CO., INC.
East Orange, N. J.

JACOBS MANUFACTURING CO.
Hartford, Conn.

JANNEY CYLINDER CO.
Holmesburg, Philadelphia, Penn.

CHARLES L. JARVIS CO.
Middletown, Conn.

JERGENS TOOL SPECIALTY CO.
Cleveland, Ohio

JOHNSON GAGE CO.
Bloomfield, Conn.

JONES & LAMSON MACHINE CO.
Springfield, Vt.

KALAMAZOO TANK & SILO CO.
Machine Tool Div.
Kalamazoo, Mich.

KELLERFLEX PRATT & WHITNEY
Div. Niles-Bement-Pond Co.
West Hartford, Conn.

KENNAMETAL, INC.
Latrobe, Penn.

LASSY TOOL CO.
Plainville, Conn.

APRIL 10, 11, 12, 13, 14

Convention Hall and Commercial Museum

Philadelphia, Pennsylvania

LAST WORD SALES & ENGINEERING CO.
Royal Oak, Mich.

LATROBE ELECTRIC STEEL CO.
Latrobe, Penn.

K. O. LEE CO.
Aberdeen, S. D.

LINK-BELT CO.
Chicago, Ill.

LIPE-ROLLWAY CORP.
Syracuse, N. Y.

LIVINGSTONE ENGINEERING CO.
Worcester, Mass.

LOGAN ENGINEERING CO.
Chicago, Ill.

LOGANSPORT MACHINE CO., INC.
Logansport, Ind.

LOVEJOY TOOL CO., INC.
Springfield, Vt.

LUFKIN RULE CO.
Saginaw, Mich.

MACKLIN CO.
Jackson, Mich.

MADISON MANUFACTURING CO.
Muskegon, Mich.

MARKEM MACHINE CO.
Keene, N. H.

THE MARTINDALE ELECTRIC CO.
Lakewood, Cleveland, Ohio

MARVIN MACHINE PRODUCTS, INC.
Detroit, Mich.

MICHIGAN TOOL CO.
Detroit, Mich.

MICROMATIC HONE CORP.
Detroit, Mich.

MICRO SWITCH
Div. of First Industrial Corp.
Freeport, Ill.

MILLER MOTOR CO.
Chicago, Ill.

A. MILNE & CO.
New York, N. Y.

MILTON EQUIPMENT CO.
Philadelphia, Penn.

MODERNAIR CORP.
Oakland, Calif.

MONTGOMERY & CO., INC.
New York, N. Y.

MOORE PRODUCTS CO.
Philadelphia, Penn.

MOORE SPECIAL TOOL CO., INC.
Bridgeport, Conn.

MORTON MACHINE WORKS
Ferndale, Mich.

McCASKEY REGISTER CO.
Industrial Div.
Alliance, Ohio

McGRAW-HILL PUBLISHING CO., INC.
American Machinist
New York, N. Y.

MUELLER ENGINEERING CO.
Dearborn, Mich.

NATIONAL BROACH & MACHINE CO.
Detroit, Mich.

NATIONAL TOOL CO.
Cleveland, Ohio

NATIONAL TOOL SALVAGE CO.
Detroit, Mich.

NELCO TOOL CO., INC.
Manchester, Conn.

NICHOLS-MORRIS CORP.
New York, N. Y.

NILSSON GAGE CO., INC.
Poughkeepsie, N. Y.

C. A. NORGREN CO.
Denver, Colo.

NORTON CO.
Worcester, Mass.

THE OHIO CRANKSHAFT CO.
Tocco Division
Cleveland, Ohio

THE O. K. TOOL CO.
Div. of Williams & Hussey Machine Co.
Shelton, Conn.

O'NEIL-IRWIN MFG. CO.
Lake City, Minn.

ORTMAN-MILLER MACHINE CO., INC.
Hammond, Ind.

OZALID
Div. of General Aniline and Film Corp.
Johnson City, N. Y.

PANGBORN CORP.
Hagerstown, Md.

PEDRICK TOOL & MACHINE CO.
Philadelphia, Penn.

PENTON PUBLISHING CO.
Cleveland, Ohio

PHYSICISTS RESEARCH CO.
Ann Arbor, Mich.

PINES ENGINEERING CO., INC.
Aurora, Ill.

PIONEER PUMP & MFG. CO.
Detroit, Mich.

PIVOT PUNCH & DIE CORP.
N. Tonawanda, N. Y.

THE FREDERICK POST CO.
Chicago, Ill.

HORACE T. POTTS
Philadelphia, Penn.

PRATT & WHITNEY
Div. Niles-Bement-Pond Co.
West Hartford, Conn.

PRECISE PRODUCTS CO.
Racine, Wis.

PRECISION DETROIT CO.
Detroit, Mich.

PRECISION GRINDING WHEEL CO., INC.
Philadelphia, Penn.

THE PRODUCTO MACHINE CO.
Bridgeport, Conn.

PUTNAM TOOL CO.
Detroit, Mich.

RACINE TOOL & MACHINE CO.
Racine, Wis.

REPUBLIC GAGE CO.
Detroit, Mich.

RIVETT LATHE & GRINDER, INC.
Brighton, Mass.

ROCKWELL MFG. CO.
Power Tool Div.
Milwaukee, Wis.

ROSS OPERATING VALVE CO.
Detroit, Mich.

H. B. ROUSE & CO.
Chicago, Ill.

ROYAL OAK TOOL & MACHINE CO.
Royal Oak, Mich.

RUSSELL, HOLBROOK & HENDERSON, INC.
New York, N. Y.

SALES SERVICE MACHINE TOOL CO.
St. Paul, Minn.

SCHAUER MFG. CORP.
Cincinnati, Ohio

GEORGE SCHERR CO., INC.
New York, N. Y.

A. SCHRADER'S SON
Brooklyn, N. Y.

SCULLY-JONES & CO.
Chicago, Ill.

SEIBERT & SONS, INC.
East Peoria, Ill.

SERVICE MACHINE CO.
Chicago, Ill.

SEVERANCE TOOL INDUSTRIES, INC.
Saginaw, Mich.

SHEFFIELD CORP.
Dayton, Ohio

SHELDON MACHINE CO., INC.
Chicago, Ill.

SHELL OIL COMPANY, INC.
New York, N. Y.

SIMONDS SAW AND STEEL CO.
Simonds Abrasive Co.
Fitchburg, Mass.

SIZE CONTROL CO.
Chicago, Ill.

SOUTH BEND LATHE WORKS
South Bend, Ind.

STANDARD DIE SET MFRS., INC.
Cranston, R. I.

STANDARD ELECTRICAL TOOL CO.
Cincinnati, Ohio

STANDARD GAGE CO., INC.
Poughkeepsie, N. Y.

STANDARD PRESSED STEEL CO.
Jenkintown, Penn.

STANDARD SHOP EQUIPMENT CO.
Philadelphia, Penn.

THE STAPLES TOOL CO.
Cincinnati, Ohio

L. S. STARRETT CO.
Athol, Mass.

STEEL PRODUCTS ENGINEERING CO.
Springfield, Ohio

STOKERUNIT CORP.
Milwaukee, Wis.

STONE MACHINERY CO., INC.
Manlius, N. Y.

D. A. STUART OIL CO., LTD.
Chicago, Ill.

SUN OIL CO.
Philadelphia, Penn.

SUNDSTRAND MACHINE TOOL CO.
Hydraulics Division
Pneumatic Products
Rockford, Ill.

SUNDSTRAND MAGNETIC PRODUCTS CO.
Rockford, Ill.

SUNNEN PRODUCTS CO.
St. Louis, Mo.

SUPER TOOL CO.
Detroit, Mich.

TAFT-PEIRCE MFG. CO.
Woonsocket, R. I.

TECHNICAL PUBLISHING CO.
Cleveland, Ohio

THE TEXAS CO.
Industrial Sales Training
New York, N. Y.

THREADWELL TAP & DIE CO.
Greenfield, Mass.

TIDE WATER ASSOCIATED OIL CO., INC.
New York, N. Y.

TINIUS OLSEN TESTING MACHINE CO.
Willow Grove, Penn.

THE TOMKINS-JOHNSON CO.
Jackson, Mich.

TWENTIETH CENTURY MFG. CO.
Chicago, Ill.

UNION MANUFACTURING CO.
New Britain, Conn.

UNIVERSAL VISE & TOOL CO.
Parma, Mich.

UNIVERTICAL MACHINE CO.
Royal Oak, Mich.

THE V & O PRESS CO.
Hudson, N. Y.

VANADIUM-ALLOYS STEEL CO.
Latrobe, Penn.

VAPOR BLAST MFG. CO.
Milwaukee, Wis.

VICKERS, INC.
Detroit, Mich.

THE VIKING TOOL CO.
Shelton, Conn.

VLIER MFG. CO.
Los Angeles, Calif.

THE VULCAN TOOL CO.
Dayton, Ohio

WALDES-KOHINOOR, INC.
Long Island City, N. Y.

WALES-STRIPPIT CORP.
N. Tonawanda, N. Y.

WALKER-TURNER
Div. Kearney & Trecker Corp.
Plainfield, N. J.

WESSON CO.
Ferndale, Mich.

WEST POINT MFG. CO.
Farmington, Mich.

S. B. WHISTLER & SONS, INC.
Buffalo, N. Y.

WHITMAN & BARNES
Plymouth, Mich.

WHITON MACHINE CO.
New London, Conn.

THE WICKMAN MFG. CO.
Detroit, Mich.

WILSON MECHANICAL INSTRUMENT CO., INC.
Associate of American Chain and Cable Co., Inc.
New York, N. Y.

WILTON TOOL MFG. CO.
Chicago, Ill.

N. A. WOODWORTH CO.
Detroit, Mich.

ZAGAR TOOL, INC.
Euclid, Ohio

Seventeen Candidates Enter Race for '50-'51 Society Directorships

Members Cast Straw Vote This Month to Guide Delegates in April Election

SEVENTEEN CANDIDATES for ASTE national directors have been named by the Society's Annual Nominating Committee. Meeting December 11 at Detroit, I. F. Holland of Hartford, chairman, and his committeemen, J. H. Schron of Cleveland, Anton Peck, Los Angeles, George Exley, Baltimore and Thomas Barber, Chicago, drew up a slate of nominees for the 1950-51 term.

From the 17 men chosen, 10 directors will be elected at the House of Delegates meeting in Philadelphia, April 13. The 11th directorship will be filled by R. B. Douglas, Society president. Under the provisions of the constitution, "the retiring president shall automatically become a director from the date of his retirement until next annual meeting."

The constitution also stipulates that the names of other national officers "must be placed on the ballot for the next succeeding election of directors." Such nominees include: H. L. Tigges, first vice-president, J. J. Demuth, second vice-president, Halsey F. Owen, third vice-president, W. B. McClellan, national secretary, and G. A. Goodwin, national treasurer.

Incumbent directors nominated are: L. B. Bellamy, V. H. Ericson, A. D. Lewis and R. F. Waindle.

In addition J. P. Crosby, E. W. Ernst, C. H. Peters, O. R. Reller, Gardner Young, W. R. Smith, C. H. Scheihing and M. M. Ross also are candidates to represent the membership in the Society's governing body.

During January business meetings of the 80 chapters of the Society, members will indicate their preferences among these candidates, for guidance of their chapter delegates. Brochures to be distributed list nominees' qualifications as follows:

CANDIDATES

Incumbent National Officers

Herbert L. Tigges—1st v.-pres. and incumbent director (3rd term), ASTE. Executive v.-pres., Baker Brothers, Inc., Toledo, Ohio. Senior member since 1936. Served on National Editorial Com. Wide and varied experience in responsible industrial positions. Past director, National Machine Tool Builders' Association. Advisor and consultant to National Securities Resources Board, Washington, D. C., on machine tool work of Manufacturing Products Div. Director, Amtea Corp., New York City. Active in numerous technical, professional and civic organizations. President, Toledo Sales Executives Club.

* * *

J. J. Demuth—2nd v.-pres. and incumbent director, ASTE. General supt., member of Executive Com., Sligo, Inc., St. Louis, Mo. Senior member since 1941. Has served as 2nd v.-chm., 1st v.-chm., and chm., St. Louis chapter; v.-chm., and chm., National Constitution and By-Laws Com. Wide and varied experience in executive and responsible industrial positions. Registered Professional Engineer and member of other technical societies.

* * *

Halsey F. Owen—3rd v.-pres., ASTE. Associate professor of industrial engineering, Purdue University, Lafayette, Ind. Senior member since 1946. Member, National Education Com. (2 terms) and past chm. Extensive tool engineering experience. B.S. degree in Mechanical Engineering; degree of Mechanical Engineer.

* * *

W. B. McClellan—National sec'y. (2 terms), ASTE. Engineer, Gairing Tool Co., Detroit, Mich. Specializing on adaptation of cutting tools to special machine tool equipment. Senior member since 1935. In addition to heading several Detroit chapter committees, he has been 2nd v.-chm., 1st v.-chm. and chm. of Detroit chapter. Past v.-chm., National Program Com., past chm., National Editorial Com. (two terms). Active in other technical societies.

R. B. Douglas

H. L. Tigges

J. J. Demuth

H. F. Owen

W. B. McClellan

G. A. Goodwin

L. B. Bellamy

R. F. Waindle

V. H. Ericson

A. D. Lewis

* * *

George A. Goodwin—National treas., ASTE. Chief process eng., Master Electric Co., Dayton, Ohio. Senior member since 1938. Charter member, former v.-chm., chm., and committeeman, Dayton chapter. National director (one term), past chm. and incumbent member, National Finance Com. Has served in engineering and executive capacities since 1910. Member of Advisory Council on Tool Engineering of Sinclair College. Active in other technical and civic organizations.

Directors Nominated for Re-election

Leslie B. Bellamy—Branch manager, Detroit office, Sterling Grinding Wheel Div., Cleveland Quarries. Senior member since 1939. Has served as chm. of several committees and chapter chm., Detroit chapter. Past chm., Data Sheet Sub-Com. Chm., National Standards Com. and member, National Editorial Com. Long experience in tool engineering with leading automotive company, in tool design and as chief tool research eng. Member, Engineering Society of Detroit and ASTE representative on Vocational Guidance Com., ESD. Active in other technical, professional and civic organizations. Registered Professional Engineer.

* * *

V. H. Ericson—President and sales mgr., Johnson deVou, Inc., Worcester, Mass. Senior member since 1939. Active in Worcester chapter. Past chm., chapter Editorial Com. Has been area v.-chm. (two terms) and chm., National Membership Com. Former member, National Finance Com. Past national treas. (two terms) and past 3rd v.-pres. Outstanding authority on grinding processes.

* * *

Arthur D. Lewis—Owner and mgr., Art Lewis Production Equipment Co., Glendale, Calif. Senior member since 1942. Has served in numerous chapter capacities culminating in chairmanship, Los Angeles chapter. Former member, National Program Com. Wide industrial and executive experience. Registered Professional Engineer.

* * *

Roger F. Waindle—Gen. mgr., Industrial Products Div., Elgin National Watch Co., Aurora, Ill. Senior member since 1945. Charter member and past chm., Fox River Valley chapter. Active in chapter affairs. Former member National Finance Com. Has held responsible industrial executive positions. Active in other

technical, social and civic organizations. Registered Professional Engineer. B.S. degree in Mechanical Engineering.

Additional Nominees

Joseph P. Crosby—V.-pres. and sales mgr., The Lapointe Machine Tool Co., Hudson, Mass. Senior member since 1941. Has held chapter committee chairmanships; present chm., Boston chapter. Wide industrial experience; membership in other trade and professional groups. Registered Professional Engineer. Active in local civic organizations.

* * *

E. W. Ernst—Supt., Punching, Tool and Die Div., General Electric Co., Schenectady, N. Y. Senior member since 1938. Past chm., Schenectady chapter. Former chm., National Standards Com. (3 terms). Chm., Tool Engineers Handbook Com. (6 terms). ASTE representative on various American Standards Association committees. Active in other professional organizations and in civic affairs.

* * *

Charles H. Peters—Pres., Louisville Metal Treating Service, Louisville, Ky. Senior member since 1943. Active in chapter committees and past chm., Louisville chapter. Former member, National Program Com. Comprehensive industrial experience. Active in other professional organizations and in civic affairs.

* * *

Otto R. Reller—V.-pres., Moline Tool Co., Moline, Ill. Senior member since 1938. Charter member, Tri-Cities chapter. In addition to serving on chapter committees, he is a past chapter chm., (2 terms). Has held responsible positions in industry. Active in civic affairs. Degree of Mechanical Engineer.

* * *

Milburn M. Ross—Owner, Ross Engineering & Equipment Co., Wichita, Kans. Senior member since 1938. Has held several chapter offices including chm. and 1st v.-chm. Former area v.-chm., National Public Relations Com. Former member, National Membership Com. Wide experience in industry. Active in other professional groups.

* * *

Charles W. Scheihing—Sales mgr., The Producto Corp., Cleveland, Ohio. Senior member since 1937. Has served as treas. and chm. of several committees, Cleveland chapter. Has held responsible industrial positions. Member of other professional and trade associations. Active in civic groups.

* * *

William R. Smith—V.-pres. and gen. mgr., Southern Saw Works, East Point, Ga. Senior member since 1942. Charter member, Atlanta chapter. Past chapter chm. and incumbent chm., chapter Education Com. Wide industrial experience.

* * *

Gardner Young—Tool supervisor, Westinghouse Electric Corp., Pittsburgh, Penn. Senior member since 1937. Has served as treas., v.-chm. and chm., as well as delegate, Pittsburgh chapter. Incumbent 2nd v.-chm., National Program Com. Comprehensive experience in tool engineering.

J. P. Crosby

E. W. Ernst

M. M. Ross

Gardner Young

C. W. Scheihing

W. R. Smith

C. H. Peters

O. R. Reller

Stein Blames Designer For Fatigue Failures

Madison, Wis.—Fully 90 percent of all fatigue failures are traceable to design, while the remainder are the responsibility of the metallurgist, according to H. A. Stein, metallurgist, Gisholt Machine Co.

A better understanding between the designer and the heat treater can prevent such failures, Mr. Stein told 63 members and guests of Madison chapter at their November 8 dinner meeting.

Sharp corners, Mr. Stein cautioned, are likely to cause hardening cracks, while heavy sections integral with light sections should be avoided to avert stresses.

If production warrants, he pointed out, parts containing variable sections can be hardened either by austempering or martempering.

To insure proper heat treatment, the speaker recommended using generous fillets, keeping tapped holes away from edges, avoiding keyways near bores or drilled holes, and notches, in addition to specifying proper material and heat treating. A lively discussion from the floor followed Mr. Stein's talk.

Guests included Arthur Schaeffer, one of the first tool engineers in Wisconsin.

Tigges Tells Army, Navy Potential of Tool Industry

Brooklyn, N. Y.—H. L. Tigges, first vice-president of ASTE and executive vice-president of Baker Brothers, Inc., Toledo, Ohio, recently told the Armed Services how the machine tool industry could function in a national emergency.

Mr. Tigges, who directs mobilization planning of the machine tool section of the National Security Resources Board at Washington, read a paper and led a discussion on the "Mobilization and Potential of the Machine Tool Industry" before 150 reserve officers of the Army and Navy at the U. S. Naval Receiving Station, Brooklyn.

The ASTE officer participated in the two-week Second Annual Economic and Industrial Conference sponsored by the Commandant of the Third Naval District.

Among other industrialists and military men who lectured during the conference, and their subjects, were: R. F. Sentner, assistant vice-president, U. S. Steel Corp., "Mobilization Planning of the Steel Industry," Harry Blythe, head of production planning, Munitions Board, "The Master Plan," Major George Fielding Eliot, "Critical World Military Situation," Lt. Gen. Leslie R. Groves, "Atomic Energy for Military Purposes," and Hon. Tsune-Chi-Yu, Chinese ambassador to Italy, "Economic Potential of the Far East."

Berna Says Old Tools Cut Output More Than Strikes

Boston, Mass. — Production losses through obsolescence of machine tool equipment far exceed those suffered through steel and coal strikes, Tell Berna, general manager of the National Machine Tool Builders' Association, told more than 200 members and guest industrialists attending Boston chapter's annual executives night, November 10, at New England Mutual Hall.

Forty-three percent of machine tools now in use, according to Mr. Berna, are at least 10 years old and 95 percent are even older. Negligence in replacing this out-of-date equipment lowers productivity and profits, he added.

Mr. Berna also discussed such management problems as personnel, competition and government attitude towards the machine tool industry, illustrating each with humorous anecdotes.

Guests included a large group of executives from plants in and around Boston.

Ericson Named President

Worcester, Mass.—Victor H. Ericson was elected president of Johnson deVou, Inc., at a recent meeting of the board of directors. Mr. Ericson, who was formerly vice-president and sales manager, will retain the latter post. He is a national director and former national treasurer of ASTE.

Mr. Ericson succeeds Alden P. Johnson in the presidency of his company. Mr. Johnson is retiring from active participation in the firm because of ill health.

'Air Wave' Buff Prevents Fire in Buffing Wheels

Hamilton, Ont.—Distinction between polishing and buffing, and materials and methods used in their application were described to Hamilton chapter members by John Acheson of Canadian Hanson & Van Winkle Co., Ltd.

Speaking before the chapter's November 11 dinner meeting at Fischer's Hotel, Mr. Acheson explained that, in polishing, an abrasive is cemented to the wheel whereas buffing wheels, usually made of cotton or wool, have the abrasive applied in cake or stick form.

The speaker displayed samples of wheels made of wool felt, cotton discs, sheepskin, walrus hides, neck hides of bulls and other soft materials.

A serious problem in buffing, he commented, is preventing the wheel from catching fire through friction-generated heat. To overcome this an "air wave" buff has been developed with a metal separator in the center which draws in air and cools the wheel.

Shows Abrasive Samples

Buffs are only as efficient as their ability to retain the buffing agent, the speaker went on to say. The grade of abrasive is determined by the type of job to be done. Describing abrasives and their use, Mr. Acheson showed samples of ground pumice from Sheffield and silica from Italy used for buffing silver, chromium oxide from Turkey, for obtaining a mirror finish on stainless steel flatware, rouge powder for polishing silver, and emery, one of the first abrasives used in the trade. He also displayed two products of the electric furnace—aluminum oxide, used for polishing stainless steel, and silicon carbide, a cutting agent.

Concluding, Mr. Acheson emphasized that industry is always striving to do a better polishing job cheaper. This has resulted in ball burnishing with soap chips in a wooden barrel, electro polishing, polishing with highly polished rolls during the rolling operation, and automatic buffing machines used for production work on items like car door handles.

At the conclusion of a question period, Frank E. P. Griggs, sales manager of Canadian Hanson & Van Winkle Co., Ltd., showed a film illustrating mechanical production buffing and polishing machines.

William Orlick introduced the speaker and George Bryant thanked him.

Wilson Receives Award

Detroit, Mich.—Through inadvertence the name of Frank W. Wilson, ASTE Handbook editor, was omitted in the December issue from the list of those receiving certificates of appreciation "in recognition of an outstanding contribution to the Society through tireless effort and unselfish service in the conception, preparation and publication of the 'Tool Engineers Handbook.'"

Certificates were presented to Mr. Wilson and members of the Handbook Committee during the Society's semi-annual dinner at Montreal.

Winston-Salem Engineers Chartered as 82nd Chapter

Winston-Salem, N.C.—For the fourth time in two months the Society welcomed a new ASTE group, November 29, when 58 tool engineers in the Winston-Salem area were chartered as Piedmont chapter, No. 82.

J. J. Demuth of St. Louis, second vice-president, presented the charter and installed officers elected during the dinner meeting at Robert E. Lee Hotel. The officers are: Chairman, J. D. Schiller, radio shops, Western Electric Co., first vice-chairman, A. F. Moosbrugger, and second vice-chairman, C. J. Rix, buyers at Western Electric Co., Winston-Salem, secretary, S. B. Jeffreys, owner, Jeffreys Engineering & Equipment Co., Greensboro, and treasurer, E. N. Dietler of Charlotte, district representative, Crucible Steel Co. of America.

Harry Krusz, general manager of the Chamber of Commerce, and P. H. Hanes, Jr., chamber president, complimented the chapter on its foundation.

Dr. Harry Osborn, Jr. of Cleveland, national membership chairman, and H. E. Conrad of Detroit, executive secretary of the Society, spoke briefly on the organization's aims and purposes.

At the conclusion of the business program Graham Frazier of Charlotte, vice-president of the J. W. Frazier Co., presented a program of slides and motion pictures on arc-welding.

The charter meeting culminated five months of preparation and planning on the part of a small group of local engineers.

Other charter members are: Roy Palmer, Harry C. Amidon, Emsley Armfield, Jr., Robert I. Butts, Theophile Corbeels, Andrew David, John J. Dean, Jr., Albert R. Fairchild, A. E. Fey, Wilbur E. Finwall, Frank J. Fuchs, Carl J. Hackbarth, James J. Hairston, Edwin S. Hubbard, Charles F. Koelmel, William D. Kolb, Arthur P. Kromer, Norman R. LeDuc.

Philip Margolin, Clifton H. Matthews, Thomas B. Pratt, Jr., Walter H. Reichelt, Daniel W. Riggs, Robert P. Schneider, Alfred R. Slovenz, Robert R. Triplette, Lindsay L. Walker, Jr., Charles O. Wolff and Fred W. Yancey, all of Western Electric Co., Winston-Salem.

Eugene E. Edmiston, Mooresville Mills, Mooresville, Edgar M. Ketchie, Ketchie-Houston Machine Co., Concord, Robert W. Miller, Ohio Crankshaft Co., Cleveland, Ohio, James A. Norungold, Saco Lowell Shops, Sanford, Fred Farrar, Ferguson Gear Co., Gastonia.

Everett W. Allen, Precision Gear & Machine Co., Ned B. Honeycutt and James M. Reid, Henry Walke Co., Joseph H. Quill and Louis V. Sutton, Jr., Whittin Machine Works, Erval M. Richey, Carolina Metal Products, Inc., Edwin J. Zagora and Otto F. Zagora, J. Zagora Machine & Gear Co., Inc., and George P. Watson, Kendall Mills, all of Charlotte.

Charles L. Bolick and Howard W. Bumgarner, Precision Industries, Inc., and Charles F. Lutz, Dennison Machine Tool Co., Hickory.

John G. Collison, Acme Engineering Co., Inc., and James S. Longdon, Longdon Sales Corp., Greensboro; Robert W. Gassin, J. E. Sirrine & Co., Greenville, Samuel A. Harris, Briggs-Shaffner Co., Winston-Salem, Thomas S. Hopkins, Carney & Associates, Ltd., Allentown, Penn., James R. Huntley, Tool Service Engineering Co., Monroe and James A. MacDonald, Glass Machinery Co., Fairfield, Conn.

Upper: John Acheson of Canadian Hanson & Van Winkle Co. describes buffing and polishing methods and materials to Hamilton members. From left: William Peacock, second vice-chairman, Frank Griggs, also of Canadian Hanson & Van Winkle, William Orlick, who introduced the speaker, Mr. Acheson, and George Gilmour, chapter chairman. Lower: Members and their wives glide around the dance floor at Brant Inn, Burlington, Ont., during annual ladies night.

Our Society

By Harry E. Conrad

As reported last month space in the ASTE Industrial (Cost Cutting) Exposition to be held in Philadephia the week of April 10th was being taken at a rapid rate. The report this month is—SOLD OUT. It appears that we will be forced to make more space available particularly because of the demands of some of our regular exhibitors who were late in making space reservations. Fortunately additional space is available to us and right now we are working on a layout for increased area. If necessary the new layout will be released shortly, and when this space is gone there definitely will be no more. We've been working for four years to get in a position to say "Sorry, sold out." It's a grand feeling.

Fifteen technical sessions comprising a total of 21 papers are being planned for the annual convention—another outstanding technical program that no one interested in the field of Tool Engineering can afford to miss. In addition there will be plant tours which will cover a wide diversification of industry in and around Philadelphia.

Something new has been added to the Philadelphia meeting—an economic forum with some of the top flight economists of the country participating. The forum will be held Monday evening, April 10, at the Academy of Music in Philadelphia. This will be beyond any question one of the outstanding events in the entire country and will arouse the interest of thinking people all over the world. The forum will be based on a discussion of the "Rebirth of the Free Enterprise System." More details on this and other convention activities later.

* * *

The Handbook sales have held up remarkably well and the second printing is now tentatively scheduled along about March. The arrangement for purchases by our Canadian members has worked out very well with one exception. A group of September orders was held up by Customs and temporarily lost. This caused considerable inconvenience and anxiety on the part of the members involved to say nothing of the grey hairs which the mix-up promoted here.

Speaking of Customs—our material from the Montreal meeting finally broke through the red tape and was delivered to headquarters December 14; remember the meeting was in October. These customs people give almost as good service as we are sometime accused of giving. Anyway we've made a New Year's resolution to do better.

Cogburn Goes to S. A.

Atlanta, Ga.—James C. Cogburn, Jr., principal engineer with Williams Bros. Corp., Chamblee, has been assigned to Caracas, Venezuela, to handle the company's field engineering there.

Mr. Cogburn is a former chairman of Atlanta chapter and incumbent chairman of the Membership Committee.

Upper: Local engineering students assisting in the organization of junior section of Racine chapter are from left, front row: William Christensen, Arthur Petzke, Jr., Harvey Zimmerman and John Seebeck. Back row: Otto Ludwig, Jr., Lee Flynn, Edward Piel, Jr., Thomas Yentz and Donald LaMere. Lower: Dinner group at meeting where advantages of junior organization were presented by H. F. Owen, ASTE vice-president and Purdue professor.

Bell Co. Plant Shows What Makes 'Phone Tick

Louisville, Ky.—Louisville members followed the nerve system activating a telephone, during a tour of the local Southern Bell Telephone and Telegraph Co. plant, November 9. Hunter Green, general manager, was host.

Dinner in the company dining room and a film showing the intricate machinery for mass production of telephone equipment preceded the tour.

John Yates, Kentucky manager for the company, briefed the group with statistical information concerning the company.

In small guided groups the party viewed long distance and service operations, radio network facilities and the telephoto room. Interest also centered around the dial system, the power room and the cable termination vaults.

Peirce Visits Erie

Erie, Pa.—W. B. Peirce of Pittsburgh, a former ASTE president, and student engineers from Behrend Center, Penn State College, Gannon College and the Erie Technical School were guests at the November 1 meeting of Erie chapter, held in the Commons Room of Gannon College.

After dinner Chairman Archie Weingard introduced T. J. Donovan, Jr., ASTE director from Philadelphia, who presented his "Silver Dollar Quiz."

Racine Organizing Student Section

Racine, Wis.—Benefits of a junior section of ASTE in Racine were outlined to a group of engineering students by H. F. Owen, ASTE vice-president and professor of production engineering at Purdue University, November 7, during a dinner sponsored by Racine chapter at the Racine Manufacturers Association building.

Professon Owen's presentation of a student unit plan functioning under the supervision of the senior chapter opened to the students possibilities of a wider scope to their education. The ASTE officer also pointed out the value of such an organization to Racine industry.

Another feature of the proposed program is an annual scholarship award to aid a qualified student in furthering his engineering training.

For some time George Strombeck, Racine chapter education chairman and coordinator of industrial arts at Racine Vocational School, has been working in cooperation with local education department heads to organize such a group.

Similar junior ASTE organizations are operating successfully in Philadelphia, Cleveland, Detroit, Kansas City and other industrial areas. Their value to these communities has been stressed emphatically by those participating.

Guests at the meeting included William D. Stansil, secretary of the Racine Manufacturers Association.

High Cost, Loss of Efficiency, Mechanical Problems Delay Commercial Development of Atomic Power

Rockford, Ill.—While materials are the principal stumbling block to atomic progress, there are other problems hindering commercial and industrial developments in the atomic power field.

An atomic installation to furnish 75,000 kw of electricity would cost $25 million, including a "pile" and reprocessing, steam and power plants. Cost per kwhr would be about 8 mills. A comparable coal burning plant would cost $10 million to erect and would produce power at 6½ mills per kwhr. In remote areas where coal is difficult to obtain, atomic power competition might be feasible.

At present there is little likelihood of obtaining atomic power in a form which can be used commercially. Nor for several years to come.

These facts were given to 75 Rockford members by N. J. Palladino, staff engineer, Naval Reactor Div., Argonne National Laboratories, Chicago, during an address on atomic energy possibilities in industry. Mr. Palladino was the technical speaker at a recent chapter dinner meeting at the Lafayette Hotel.

Demonstrates With Mousetraps

To illustrate the principles of a chain reaction, Mr. Palladino demonstrated with a celluloid-covered box containing about 50 loaded mousetraps, each having a cork resting on the wire flipper. Each mousetrap represented an atom and the cork a neutron. A stray neutron (cork) was dropped into the box and in a flash all the traps were sprung. This was an example of a reactor containing no moderator.

Explaining in lay terms the physics involved in atomic fission, Mr. Palladino stated that there are two types of piles or reactors. In the fast type neutrons fly off at a rate of 12,000 miles per second as in an atomic bomb. In a slow pile they are retarded to two miles per second. A fast pile reaction takes place in a fraction of a second, but is very inefficient. The bombs dropped on Japan were only 0.001 percent of the potential.

The slower pile, having a longer time element, has a higher efficiency.

To make a pile one must have U-235, a moderator, and a balance between production and loss of neutrons. The pile must be big enough to compensate for leakage and absorption of neutrons.

Piles are classified according to their construction, homogeneous or heterogeneous, enrichment, energy of neutrons, and application. Mr. Palladino pointed out that the top limit on heat produced is 30 billion deg. F., but with present materials this limit is considerably lower.

The heat released in a power reactor during atomic fission and the water used in keeping the pile from overheating could be utilized to run a steam turbine. But the water becomes radioactive and all the equipment would have to be shielded.

Since lubricants break down under radioactivity, it would be difficult to prevent friction in the turbine. It might be possible to isolate the pile and use a coolant—heavy water or helium—running through a closed circuit.

Problems in Producing Steam

The heat of the pile is absorbed through a heat exchanger by water and transferred to the turbine for steam power. Here another problem presents itself—heavy water is a satisfactory heat transfer fluid at low temperatures, but will not work at the high heat required for efficiency in a pile.

Core of the reactor is composed of the fissionable material and a moderator. The moderator must be of a light element and non-absorbing. Heavy water, which contains a radioactive hydrogen twice as heavy as the ordinary type, makes a good moderator, but only for low temperature piles because it corrodes uranium at higher temperatures.

Steel can stand high temperatures, but it absorbs so many neutrons that the chain reaction would stop or become very inefficient. Carbon in the form of graphite has proved out. Beryllium meets both temperature and neutron-absorption requirements. Unfortunately it is scarce and hard to work.

Surrounding the core is a reflector for the neutrons. This also acts as a moderator, slowing down the neutrons.

Cadmium Rod Controls Power

Another important part of the pile is the control rod. Its role is to neutralize the extra material until it is needed. By pulling the rod out from the pile, the power level is increased. If the rod is pushed in, power is reduced. Such rods, sometimes made from cadmium, must operate in less than a second, yet be very accurate in location because reaction is swift and powerful.

Then there is the problem of heat removal—all methods seem to have some merits, but all have their weaknesses. Air is good for low temperatures. Drawbacks are oxidation and dispersal of the radioactive air. Water will cool a low temperature pile, but corrodes uranium at high heats. Helium doesn't become radioactive, but it has a tendency to leak through every joint and crack.

For protection against high penetrating gamma rays, a five-foot barrier of concrete is necessary.

Ash is another problem. When U-235

N. J. Palladino of the Argonne National Laboratories, reveals to Rockford chapter problems hindering commercial development of atomic power. William Moreland, program chairman, listens at right.

Details Tool Steel Use For ASTE-ASM Group

Rochester, N. Y.—By contrasting correct and incorrect uses of tool steels, George E. Brumbach, metallurgical engineer, Carpenter Steel Co., emphasized to Rochester tool engineers and metallurgists the four main factors in working with these materials—selection, workmanship, design and heat treatment.

Mr. Brumbach was technical speaker at the annual joint meeting of the Rochester chapters of ASTE and ASM, held November 14 at Howard Johnson's Restaurant. In the ensuing discussion the speaker capably answered interesting questions from the audience.

Before the technical session William Michaels entertained the group with stories gathered in his long experience as landscaper at Oak Hill Country Club.

William Gordon and Frank MacDonald, chairmen of the ASTE and ASM groups, respectively, welcomed the two societies and William Connelly, a member of both organizations, introduced the speaker.

Left: Frank MacDonald, chairman of Rochester ASM chapter, welcomes local ASTE members at joint meeting of two organizations. At his left is William Gordon, ASTE chairman, and, third from left, Emmett Moore, ASTE vice-chairman. Right: George Brumbach of Carpenter Steel Co. tells use and misuse of tool steels.

fissions, it breaks into two pieces—elements each weighing approximately half as much as uranium. These fission products will not fission themselves. Worse than that, they absorb neutrons, reducing the power of the pile. These poisons or ashes must be removed from the pile, but mixed with the gases is good fissionable uranium too valuable to throw away.

All of these problems, Mr. Palladino indicated, must be solved before atomic power becomes available to industry.

In the near future, he added, the Atomic Energy Commission expects to build four reactors. Two will be breeders intended to produce more nuclear fuel as well as power; one will be a type designed to test metals, ceramics and liquids that might be used in future models. The fourth reactor will be a naval propulsion unit.

At present, he concluded, industry can benefit most from the radioactive isotopes manufactured as a sideline by atomic plants and used in various fields of research.

K. L. Kinkenstaedt, executive vice-president, W. F. & John Barnes Co. and chairman of Greater Rockford Airport Authority, was the coffee speaker. Mr. Kinkenstaedt reported on the progress and problems connected with the municipal airport.

New Michigan Group Tours Tube Plant

Ann Arbor, Mich.—Waterloo Area chapter members were guests of Michigan Seamless Tube Co., S. Lyon, for their November 30 meeting.

Limited to members, the combined technical session and plant tour was attended by 94 men from the recently chartered chapter.

Following dinner in the plant cafeteria, the group saw a General Motors film on the tool engineer's contribution to the design and production of better tools and machinery.

The members were then escorted through the plant in groups of eight. This permitted everyone to hear the guides explain the work and to ask questions. As the second shift was in full production, every operation could be observed by the party.

* * *

At the previous meeting 117 members and guests inspected metal processing facilities of the Engineering College at the University of Michigan, following dinner and a speaking program at the Ann Arbor Masonic Temple cafeteria.

Professors O. W. Boston and W. W. Gilbert of the university's metal processing department, were in charge of the program. They outlined facilities and courses available to students. Slides illustrated their discussion.

The professors then invited the group to join them at the East Engineering Building for a tour of the four floors comprising the metal processing department. There the tool engineers saw the modern equipment and advanced teaching offered in the foundry, heat treat, welding, tool and machine shop, testing and research laboratories.

Muirhead Cites Economy of Long-Lived Carbide Tools

Montreal, Que.—W. T. Muirhead, managing director of A. C. Wickman (Canada) Ltd. of Toronto, Ont., addressed about 100 members and guests of Montreal chapter at a meeting November 10 in Canadian Legion Hall. His subject was "Fundamentals of Carbide Tool Applications."

After showing a British film concerning the manufacture, application and care of carbide tools, Mr. Muirhead dealt with some recent developments in carbide use, such as blanking dies and punches and the application of carbide to the percussive drilling of rock.

"Carbide rock drills will revolutionize the rock drilling industry," the speaker stated, pointing out that the success of this application is largely due to the development of a drilling machine which gives nearly 2000 light strokes per minute during its rotation. As an indication of the potential of this field, he cited one company that produces 3,000,000 steel drills per month.

"Carbide is the perfect gaging medium," said Mr. Muirhead, "as it resists wear 50 to 100 times longer than hard steel. Even on short production runs carbide gages are economical." By eliminating the 10 percent wear allowance usually built into steel gages, carbide gages will pass enough good parts, rejected by steel gages, to offset the higher cost of the carbide instruments.

Additional savings are made through few gage replacements and by eliminating frequent gage checking by inspectors.

Solid carbide gage blocks are being more widely used, the speaker said, as their long life easily makes up for their comparatively high initial cost. A special grade of carbide is used as ordinary tungsten carbide will pick up metal from parts being checked and impair the efficiency of the blocks.

Charles Gareau introduced the speaker and J. P. Cloutier thanked him.

Northrop Night at L.A. Features Aircraft Tooling

Los Angeles, Calif.—November meeting of Los Angeles chapter was designated Northrop Night and featured a program sponsored by Northrop Aircraft, Inc. The dinner meeting, held on the 10th, was attended by 127 members and guests. It was their first gathering in the chapter's new meeting place, the Institute of Aeronautical Sciences at 7660 W. Beverly Blvd.

G. F. Gerhouser, superintendent of production engineering at Northrop, discussed problems in aircraft tooling and G. N. Aron, supervisor of engineering standards, explained the recently developed unified screw thread system.

A film, "The Flying Wing," depicted one of the Northrop aircraft.

Production of Clad Steel Demonstrated in Film

Portland, Me.—How a clad steel pack is prepared and rolled to form a bond between steel backing plates, and the subsequent separation of the pack into two clad steel plates were demonstrated befor Portland members in films.

L. W. Williams, welding engineer of Lukens Steel Co., presented the film in connection with his lecture on clad steels at the chapter's November meeting. The film showed the production of nickel-, inconel-, monel-, and stainless-clad steels.

Top, from left: G. F. Gerhouser of Northrop Aircraft, Inc., technical speaker at Los Angeles November meeting, Ralph Chrissie, program and entertainment committee chairman and Northrop supervisor of tool design, and G. N. Aron, supervisor of engineering standards at Northrop and co-speaker. Below: Among dinner guests at the meeting are at left: Jack Said, Jack Pugh, Paul Pomeroy, C. K. Enoch, George Latimer and Anthony Greenfield. Right: Neil Martin, Vincent Tate, Samuel Mills, William Schram and John Shanelec.

Reidel Tells Societies Why Tool Steels Fail

St. Louis, Mo.—St. Louis chapters of ASTE and ASM met jointly December 1 at Hotel DeSoto to hear J. Y. Reidel, tool steel engineer of Bethlehem Steel Co., lecture on "Tool Steel Failures, Their Cause and Cure."

Mr. Reidel classified such failures as: (1) manufacturing and usage, (2) design failures, (3) steel or material defects, (4) forging or rolling process defects, (5) heat treating failures, (6) grinding checks, (7) heating checks, (8) premature failures in use, (9) rapid wear, and (10) mechanical failures.

The speaker won the confidence of his audience by his thorough knowledge of production, processing and application of tool steels, high speed steels, stainless steels and other special alloys. At the conclusion of his talk, he answered numerous questions from the floor.

Executives of the two societies were introduced to the 180 men present. Guests included C. N. Hazlewood, a former chairman of New Orleans chapter, ASTE, and Clyde Hause of Detroit, a past national secretary.

The ASTE group elected the following to serve as Nominating Committee: Louis Cavic, chairman, William Krueger and William Duncan.

* * *

November meeting featured William H. Fellows of Bay State Abrasive Products Co.

After reviewing grinding wheel manufacture and application, with natural and synthetic abrasives, Mr. Fellows discussed basic materials used in grinding wheels, the variation of each element and proper cutting speeds for different types of wheels. By changing abrasive bonds and grades, it is possible to obtain 12,000 different wheel combinations. Accuracy of manufacture, he emphasized, is important in any grinding wheel as is the human element. A film on grinding wheel manufacture augmented his talk.

J. J. Demuth, ASTE vice-president and a chapter member, reported on national Society affairs and stressed the importance of the Philadelphia show and convention in April.

One hundred and ten members and guests attended the meeting.

McClellan Visits Atlanta National Officers Night

Atlanta, Ga.—W. B. McClellan of Detroit, ASTE national secretary, was guest of honor at Atlanta chapter's National Officers' Night. The dinner meeting was held November 21 at the Georgia Institute of Technology.

Mr. McClellan's talk on ASTE national problems was helpful in acquainting members with the Society's methods of operation. The national secretary also gave the group a resume of the Montreal convention.

Technical speaker was R. H. Simon, special services engineer of the Edgewater, N. J., plant of Aluminum Co. of America. In discussing the machining of aluminum, he emphasized the use of taps on the high limits of tolerance for production tapping.

J. B. West, Alcoa district development engineer, presented a film, "This Is Aluminum," and explained aluminum problems in the South.

Matthew W. Kemp of the DoAll Co. was announced as Membership Committee head for the remainder of the term.

The 47 members present had as guests a group from the Georgia chapter of ASM.

Worcester Members Tour Local Arms Factory

Worcester, Mass.—Eighty-five Worcester chapter members inspected recent developments in tools for manufacturing guns in an afternoon visit to Harrington & Richardson Arms Co., November 8.

Dinner and a technical session followed at Putnam & Thurston's Restaurant. William G. O'Brien, director of manufacturing at Harrington & Richardson, reviewed the company's history and described the recent modernization of equipment.

E. B. Rhodes, former master mechanic now in charge of industrial sales for Bendix-Westinghouse Automotive Air Brake Co., discussed the production and savings realized by application of air-operated holding devices.

Special guests were ASTE Past Presidents I. F. Holland and R. H. Morris, both of Hartford, Conn. Mr. Holland spoke briefly on the organization's national activities.

Pittsburgh Chapter, Host For Christmas Party

Pittsburgh, Pa.—More than 100 Pittsburgh tool engineers were guests of their chapter for a Christmas party, December 2, at Hotel Sheraton.

After a buffet dinner Chairman Frank T. Boyd conducted a brief business session before turning the meeting over to J. M. Lloyd, program chairman.

Mr. Lloyd introduced the speaker, C. E. Herington, sales manager of the Meehanite Metal Corp. His subject, "Meehanite Means Better Castings," was especially pertinent since production men in the iron and steel center are interested in the metal which forms the design link between the two materials. Slides and a film augmented his talk.

In the ensuing discussion from the floor, E. L. Griffith, general manager of the Rosedale Foundry and Machine Co., Pittsburgh Meehanite plant, answered questions concerning applications of Meehanite with relation to local industry.

At the close of the formal session there was a social hour and refreshments.

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On November 4 Joseph R. Roubik of the research department of Kearney & Trecker Corp. and lecturer in mechanics at Marquette University, addressed 70 members attending a dinner meeting.

His lecture, "Milling Hot Workpieces," concerned possibilities of machining at elevated temperatures metals not readily machinable at ordinary temperatures.

Two new members were introduced at the meeting and 16 junior membership applications were received from students of West Penn Tech.

Describes Tube Bending

Fort Wayne, Ind.—Tube bending was the technical subject discussed at a dinner meeting of Fort Wayne chapter November 9.

Byron F. Bower, president of the Pines Engineering Co., Aurora, Ill., described types of tube bending machines and methods used in fabrication. A film and slides demonstrated how sections of tubing are bent for various industries.

Speaking on the "Anatomy of Humor," R. Nelson Snider, principal of South Side High School, entertained the group with jokes, prior to the technical session.

Speakers' table guests at Worcester chapter dinner that preceded tour of Harrington & Richardson Arms Co. plant are, from left: Bernard D. Zarek of Worcester Pressed Steel Co., chapter treasurer, Lester F. Mulno of Harrington & Richardson, chapter standards chairman, William J. O'Brien, director of manufacturing, Harrington & Richardson, V. H. Ericson, president, Johnson deVou, Inc., and ASTE director, Ralph Johnson, vice-president and general sales manager, Abrasive Div., Norton Co., Irwin F. Holland, superintendent, Small Tool and Gage Div., Pratt & Whitney, and past president of ASTE, Carl Schofield of Norton Co., chapter chairman, Ralph L. Baker, superintendent, Whitin Machine Works, and chapter secretary, E. B. Rhodes (technical speaker), Bendix-Westinghouse Automotive Air Brake Co., Carroll Morse of Heald Machine Co., chapter first vice-chairman, C. John Lindegren, Lindco, Inc., and Thomas C. Bradford, Anderson Oil Co.

Portland (Oregon) chapter officers were among the audience of members who heard F. M. Mansbery, Jr. of The Carborundum Co. and W. J. Van Meter of Kent Cliff Laboratories address a recent meeting. From left: Charles A. Magee, second vice-chairman, W. E. Brennan, editorial chairman, D. J. Melony, first vice-chairman, Mr. Van Meter, L. R. Ellingwood, chapter chairman, G. E. Healy, public relations chairman, and Mr. Mansbery.

Twin States Entertains Ladies with Dance Party

Springfield, Vt.—Sixty-six Twin States members and their women guests enjoyed a banquet and dance at the Trade Winds Cafe, December 2. Each lady received a corsage from the chapter. The program opened with group singing led by Entertainment Chairman William Piper and accompanied by Wallace Roston at the piano.

H. H. Ranney, vice-chairman, presided over the supper hour and introduced William Donahue, the featured speaker. Well known for his wit and humor as well as for his violin playing at square dances, Mr. Donahue kept his audience in constant laughter with anecdotes about local people including himself. He also rendered several violin selections.

Mr. Piper supervised drawings for door prizes, won by Edward Duclos and Paul Gates of Fellows Gear Shaper Co. and Walden Sinawski of Jones & Lamson Machine Co.

Dancing to the cafe orchestra concluded the function.

* * *

Donald Percival, general manager of Machinery Electrification, Inc., Worcester, Mass., addressed 60 members and guests assembled at the Windsor House, Windsor, Vt., November 9.

Speaking on "Which Variable Speed Drive?" Mr. Percival presented his views on the basic engineering approach to the problem of selecting the best equipment for the many types of variable speed drive applications.

Essentially all problems of this nature, he pointed out, should be approached by comparing the torque characteristics of the unit being designed with that of the various type of available equipment. Concurrent with this analysis, factors affecting cost, physical dimensions, and auxiliary equipment must be considered. Mr. Percival illustrated his talk with large graphs. A question and answer period followed.

Chairman Lee Davis presided at the banquet table and Mr. Ranney introduced the speaker. The vice-chairman also reported on the recent convention at Montreal.

Bendix Night Initiates Local Program Series

Baltimore, Md.—Bendix Night, observed November 2 at Baltimore chapter, featured E. K. Foster, general manager of Bendix Aviation Corp., Towson, as principal speaker, supported by A. C. Omberg, research director, and George Exley, a past chairman of the chapter.

An informative talk on electronics and its accompanying problems preceded motion pictures of a production line for automobile radios. The film highlighted problems, solutions and results as parts progressed from components to completed, tested and packaged units. A question period followed, over refreshments. The program was the first of a series in which local manufacturers will participate.

In a coffee talk prior to the technical session, Major Ruxton Ridgely, executive officer of the Maryland State Police, outlined activities, aims and purposes of his department. He showed a motion picture of driving hazards as viewed by a motorcycle patrolman.

During the evening seven new members were welcomed.

Bonneville Dam Powers Silicon Carbide Plant

Portland, Ore.—Silicon carbide production with Bonneville Dam power at The Carborundum Co.'s new Vancouver, Wash., plant was described for Portland members at a recent meeting in the Public Service Building Auditorium.

F. M. Mansbery, Jr., special representative for Carborundum, was the speaker. He illustrated his talk with a film, "Romance of Industry," and headed a discussion of grinding problems and application of the new fabric wheels.

As a second feature William J. Van Meter, representing Kent Cliff Laboratories, Peekskill, N. Y., demonstrated the ability of the new Kentron microhardness tester to test individual crystals of a metal specimen. Theory of the machine's design, its construction and operation also were explained to the engineers.

Powdered Metal Parts Held to Close Tolerance

Utica, N. Y.—"Application of Powder Metallurgy" was discussed by Jerome F. Kuzmik, consultant to F. J. Stokes Machinery Co., Philadelphia, and sales development engineer for Ekstrand & Thaland Co., Inc., of Sweden, at a technical meeting of Mohawk Valley chapter, November 22. The meeting was held in the chapter quarters at the Moose Home.

Mr. Kuzmik described the expanding field of powder metallurgy in producing small, intricate machine parts. He narrated a film showing the principles of powdered metals. During the discussion he disclosed that tolerances as close as 0.0005 in. could be held and that powder metallurgy was constantly proving practical and economical in producing metal parts formerly made by forging and casting. A question period followed the technical talk.

J. D. Blair, chief engineer of Divine Brothers Co., Utica, was presented with a copy of the "Tool Engineers Handbook" in recognition of his efforts in chapter activities.

E. J. Masucci, chapter chairman presided and introduced the speaker. More than 60 members attended.

* * *

Approximately 110 tool engineers participated in the chapter's first plant tour held recently at the Remington Arms Co. plant in Ilion.

S. M. Alvis, arms technical division manager, welcomed the group and detailed the management background of the arms plant. Several millions of dollars, he said, have been invested in developing new postwar arms products.

L. R. Crittendon, Dupont development engineer stationed at Ilion, spoke on model development and testing of guns. He showed high speed motion pictures of guns, taken during firing. One gun was shot over a million times in testing, Mr. Crittendon revealed. Requirements for approval include rigid tests under sand, water and weather conditions, he said.

Following the talks, the engineers separated into small groups with plant engineers as guides and toured the plant.

Ernest Masucci, chapter chairman, conducted a short business meeting before the plant inspection. Special technical programs for the remainder of the season were outlined by Albert Delmont.

Industry Uses of X-Ray Feature G. E. Tour

Milwaukee, Wis.—General Electric X-Ray Corp. was host to a large group of Milwaukee members recently for a tour of the local plant, conducted by William Kane of the company.

After the tour Mr. Kane introduced R. F. Holste who discussed the application of X-ray to industry, using slides for illustration.

A. C. Gudert, chairman, announced that the regular business session would be omitted. Herbert Heimann, program chairman, was in charge of the meeting.

Committee chairmen appointed at the first technical session of the recently chartered Des Moines chapter are from left: E. G. Stephenson, membership, Samuel Trotter, constitution and by-laws, William E. Huffman, program, Clifford W. Helstrom, public relations, and William Atkinson, education. Other appointees are Howard Campbell, editorial, and Thomas Logan, standards.

Toronto Chairman Talks On Tool Manufacture

Toronto, Ont.—Fred Crook, Toronto chapter chairman and chief engineer of Gray-Bonney Tool Co., Ltd., was technical speaker at the November 2 meeting of his chapter. His subject was "Mechanics' Hand Tools."

Mr. Crook reviewed for the 92 dinner guests the history of small tool manufacture from malleable castings to the new type of alloy forgings used today. His talk was well illustrated with slides showing machining problems. Alex Gray, president of Gray-Bonney, introduced Mr. Crook.

British Check Canadian Market

Coffee speakers were Sir Holland Goddard and W. L. Simms, in Canada on a mission for the British Machine Tool Trade Association. The British tool industry representatives indicated that they are checking on complaints and shortcomings in their tools in order to improve their service to the Canadian trade.

The chapter approved a resolution by the Executive Committee, to assist students at Ryerson Institute of Technology who are over the student membership age limit, by sponsoring the difference between student and junior dues.

Sponsors Evening Courses

Through the cooperation of the institute, the chapter is offering another evening course under the direction of John Lengbridge, chapter education chairman.

The lectures on Punch and Die Design for Pressed Metal Operations are given by Mr. Lengbridge and Lou Connoy. The course consists of theory and practice of press cutting and press drawing operations, expanding, necking, curling, forming, beading and other press operations. It also includes blank calculations, diameter reduction, cutting and drawing pressures, lubrication of metal for pressing, estimating and analyzing pressed metal costs, and developing methods of manufacture.

Held Tuesday evenings at 7:30 in the institute, the two-hour sessions will continue through March. The chapter also cooperates with the institute by furnishing instructors for other courses in the tool engineering field.

Arctic Defense Vehicles Revealed by Canadian

Windsor, Ont.—Vehicles used by the Canadian Army in "Operation Muskox" and other Arctic development work were described by Lt. Col. P. C. King, officer in charge of the tracked section, Vehicle Development Control, Ottawa, in an address before 230 Windsor area engineers.

Colonel King was guest speaker at a joint dinner meeting of Windsor chapter, ASTE, and the Border Cities branch of the Engineering Institute of Canada, held November 14 at Prince Edward Hotel.

After outlining the work of Canadian Army development agencies on general vehicle design, he presented a film, "Going North," showing some of the newer type vehicles used by the army in northern operations. This motion picture also gave the audience an idea of difficulties encountered by army engineers in constructing vehicles capable of battling the climate and general terrain of the area.

Construction of civilian and army vehicles was compared as to functions, performance and general operation.

Colonel King concluded his talk, much of which was not for publication, by discussing vehicles most suitable for the Arctic in event of an emergency. A lively question period followed.

Leslie Bellamy, ASTE director from Detroit, gave a brief resume of the Society's convention at Montreal, attended by 20 members from the chapter.

Turning Talk Initiates New Chapter's Program

Des Moines, Iowa—Ninety-five members and guests of Des Moines chapter gathered November 22 at Hotel Kirkwood for the first regular technical session of the newly chartered group.

Speaking on current advances in turning tools, S. E. Beer of Monarch Machine Tool Co., Sidney, Ohio, showed films demonstrating air gage tracer control and the Speedimatic precision hand screw machine.

As coffee speaker E. F. Butler, public relations director of the Maytag Co., commended the Society and emphasized the value of interchanging ideas.

John M. Speck, chairman, opened the meeting and installed H. G. Ringgenberg as second vice-chairman. Mr. Ringgenberg introduced Mr. Butler and W. F. Huffman, program chairman, presented the technical speaker.

During a business meeting the members voted to hold chapter meetings the third Wednesday of the month.

Situations Wanted

ASSISTANT WORKS MANAGER—available preferably for tooling, cost reduction analysis and personnel department supervision. Has record of more than 100 percent gain in tooling production and tool and die experiments resulting in large increases in output. Experienced in textile machinery, aircraft engine, boat, glass and electric industries. Box 196, American Society of Tool Engineers, 10700 Puritan Ave., Detroit 21, Mich.

GRADUATE ENGINEER—major in design and power plant engineering. Would be satisfied with drafting room work. Box 192, American Society of Tool Engineers, 10700 Puritan Ave., Detroit 21, Mich.

PRODUCTION MANAGER—seeks this or other supervisory position. Has 30 years' experience in vehicle, aircraft and machine tool manufacturing. Background includes production control, time study, layout, estimating, purchasing of production equipment, and superintendencies. Married, willing to go anywhere. Box 195, American Society of Tool Engineers, 10700 Puritan Ave., Detroit 21, Mich.

TOOL, DIE ENGINEER—39, with 23 years in jobbing shops and factories, including 14 years in supervisory positions from department head to general manager. Practical experience from machine apprentice to superintendent of tools and dies, new product engineering, tool design, tool room and press room superintendent. Prefer Western states. For further information write to Box 194, American Society of Tool Engineers, 10700 Puritan Ave., Detroit 21, Mich.

TOOL ENGINEER—30 years' experience on jigs, fixtures, dies, gages, cutting tools, machines and gears in the automotive, aircraft and radar fields. Six years as chief tool designer. Seeks position as checker, group leader, chief designer, processman or layout man. Box 193, American Society of Tool Engineers, 10700 Puritan Ave., Detroit 21, Mich.

Charter Members Feted

Elmira, N. Y.—Charter members of Elmira chapter were honored at a well attended stag party, held November 7 in Mark Twain Hotel.

The 13 honor guests were: Robert N. Paterson, chapter treasurer, Joseph G. Menihan, Edward Carrolton, George Randall, Ivan Gowdy, Leigh Evans, Burt Banks, Glenn E. Bauder, Dolph Kylor, Ralph Hopkins, W. H. Jewell, John R. Lynch, and Ross G. Williams.

After a cocktail hour, buffet supper and a clambake, the chapter was entertained with five bouts of boxing presented under the direction of Neighborhood House.

Surface Roughness Blocks Give Micro-Inch Values

Poughkeepsie, N. Y.—How surface roughness is determined in millionths of an inch was detailed to Mid-Hudson chapter by Frank O. Hoagland, master mechanic of Pratt & Whitney, Div. of Niles-Bement-Pond Co., West Hartford, Conn.

Addressing 60 members and guests during a meeting November 8 at Nelson House, Mr. Hoagland described surface roughness standards established by the American Standards Association and the specimen blocks used in comparing the surface of the finished part with the specified micro-inch value.

Suggests Varied Jig Borer Uses

In describing tooling for a jig borer, Mr. Hoagland recommended using special collets with two bearings, for greater precision than regular lathe collets. A jig borer, said Mr. Hoagland, can be used advantageously on small milling jobs where the motor is the controlling factor, for inspection of large parts on a rotary table, for grinding holes, by replacing the head stock with wheel spindles, and as a measuring machine for checking threads.

In giving jig boring dimensions, he added, the designer should establish a working surface and give all dimensions from and at right angles to that surface, to eliminate computations by the machine operator.

Coffee speaker was Hadden Johnson, executive director of the Poughkeepsie Area Development Association, Inc., who discussed plans for the city's future.

New members introduced at the meeting were: Harry Beatty, Ralph Thomas, Joseph Krusta, Levi Schryver, George F. Brenner and N. J. Kadik. Joseph L. Petz, chapter chairman, presided.

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Recently announced chapter courses, conducted in conjunction with the Poughkeepsie Board of Education, include the following subjects and instructors: Precision Measurement, William Shopmeyer; Methods Engineering, Charles Brownell; and Production Welding and Soldering, William Rich. Arrangements are being made to obtain arc welding equipment for use in the latter course.

New Courses to Be Added

Additional subjects to be offered in the near future and the respective teachers are: Shop Mathematics, William Bobalke; Jig and Fixture Design, Robert Wykstra; Heat Treatment, John Dormeyer; Automatic Screw Machine Theory, Ralph Now; and Punch Press Cutting and Forming Dies, Floyd Tilton.

Instructors are chapter members who are specialists in their respective fields. They were selected by Joseph L. Petz, chapter chairman, Robert E. Estes, education chairman, and his committee: Llewellyn H. Tenney, Frank Kopf, Ornendo Freer, John Young, Everett Sweet, Robert Wykstra, Dominic Cavaliere, Ralph Now, John Dormeyer, Charles Nilsson, Raymond Lansing and Floyd Tilton.

Blackall Scores Tax Laws as Drag on National Economy

Toledo, Ohio—Despite threatening socialistic trends, the majority of Americans, deep in their souls, still adhere to the rugged individualism of the Down-East backwoods Yankee. And when the reshuffling of major political parties comes, it will be on the basis of an honest definition of the great national issues of the day—such as Free Enterprise versus the Planned Economy.

Then, according to Frederick S. Blackall, Jr., president and treasurer of The Taft-Peirce Manufacturing Co., "we can vote for what we believe in rather than for a label and the winning party can cut out the fence straddling and really go to work on a program."

Addressing Toledo chapter's recent Past Chairman night, Mr. Blackall went on to emphasize the powerful effect which incentive and free enterprise have had on the founding and growth of our nation.

The tool engineering profession, he said, is affected by government policy toward business. Management appropriations for new programs or new machinery depend upon whether the Internal Revenue Department considers such expenditures as capital or expense. A reversal of thinking must take place, the Rhode Island industrialist declared, if we are to put our national economy on a permanently sound fiscal basis.

Every citizen, he charged, has a responsibility to see that taxes are collected with a minimum of distress and expended with a maximum of wisdom. Everything possible should be done to place our tax structure on a basis calculated to stimulate rather than discourage enterprise.

Among honor guests at the function were: A. B. Bok, Samuel Burgess, Clester Colwell, August Ehrhardt, Albert Hage, Lloyd A. Kelly, Claude E. Robitaille, Lawrence F. Rothert, and Walter Ulrich, all former chapter heads.

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Carl J. Oxford, chief engineer, National Twist Drill & Tool Co., addressed 105 members and guests, November 9, on "Machinability and Problems of Production."

His slide-illustrated talk included problems encountered in milling and drilling operations. The question and answer period followed Mr. Oxford's lecture indicated live interest in his subject.

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On October 29 chapter members were guests of the Ohio Bell Telephone Co. for a tour of the company's main offices. The trip started with a demonstration of the proper method of dialing a number and an explanation of what happens in the exchange during the operation.

A highlight of the trip was the television and radio control room where four television programs could be viewed simultaneously. Quality of programs passing through the transmission lines is controlled from this room, as the telecasts are routed to TV stations.

Left: Adam Gabriel (left), ASTE delegate to the ASA, and L. B. Bellamy, ASTE director and national standards chairman, were featured speakers at Chicago chapter, November 8. Center: Roger Waindle, national director, reports on Montreal convention. Right: John Beck (left), chapter standards chairman, discusses committee activities with S. F. Girard, central office secretary to the national committee.

Metric System Founded To Aid Napoleonic Wars

Chicago, Ill.—Although standardization had some usage in ancient building construction, it had its first real impetus in Napoleon's day. At that time the variation in volumetric quantity standards so hampered the "little corporal's" war effort that standards of length, volume and weight—the meter, the liter, and the gram—were established and used by government compulsion.

Progress of standards through the ages and how they affect the tool engineer were related to Chicago chapter by two of the Society's authorities in this field. L. B. Bellamy of Detroit, ASTE director and national standards chairman, and Adam Gabriel, Sr., of Chicago, ASTE delegate to the ASA, addressed an audience of 175 members and guests attending a chapter dinner meeting November 8 at the Western Society of Engineers.

In 1804, the tool engineers were told, metric standards were introduced in the United States. At the close of World War I recognition of the necessity for greater standardization resulted in the formation of the American Standards Association. In its own standardization program the Society is cooperating with ASA and helping industry to improve productivity. The "Tool Engineers Handbook" was cited as an example of the Society's activities in eliminating duplication of effort.

Anton Schwister, chapter chairman, introduced Roger Waindle, ASTE director from Fox River Valley chapter at St. Charles, who reported on the Montreal convention.

John Beck, Chicago chapter standards chairman, urged all members to participate in chapter committee activities.

Allied Students See How Gages Are Made

Chicago, Ill.—Approximately 50 student members of the Allied School of Mechanical Trades section of Chicago chapter saw gages being manufactured in a recent visit to Size Control Co., a division to American Gage & Machine Co.

Ernest E. Olds, sales manager, conducted the party through the plant in small groups, giving the young men opportunity to observe operations closely and to ask questions. From raw stock to finished product, each step was eagerly noted. Department foremen and factory workers participated in discussions around the machines.

The students were particularly interested in methods used to grind reversible thread plug gages. They paid close attention to carbide thread grinding and to convoluting operations.

In the lapping room the group saw how cylindrical gages are finished on centerless lapping machines. Cast iron lapping rolls are used for roughing and copper ones for the final finishing prior to inspection in the temperature-controlled room.

The students asked questions about instruments used in final inspection of gages and received samples of surface finishes.

Before the tours the groups were briefed on plant operations and gage uses. These discussions were continued after the inspection trips, enabling the students to review and summarize what they had seen.

Prominent at November meeting of Evansville chapter, were from left: E. F. Walsh of Pollack Steel Co., who presented film on steel making, A. J. Harris, program chairman for the occasion, and W. V. Stippler, first vice-chairman.

Making of Rail Steel Pictured in Film

Evansville, Ind.—Sixty-five members of Evansville chapter met at the Alpine House, November 21, for a combined dinner and technical meeting.

E. F. Walsh, representing the Pollak Steel Co., presented a film, "Rail Steel in the World of Tomorrow." Narrated by Lowell Thomas, the motion picture depicted the history and current methods of producing rail steel from mine to rolling mill. A short question and answer period followed.

Alwin J. Harris of Farm Tools, Inc. was in charge of the program.

Claims Gear Was First Form of Power Transmission

Philadelphia, Pa.—According to popular belief the flat belt and pulley combination is as old as the ages, but research indicates that the toothed gear was the earliest form of mechanical power for transmitting continuous motion.

This and other fallacies concerning the origin of power transmission were exploded by W. A. Williams, chief engineer of the American Pulley Co., during an ASTE-sponsored student meeting at Villanova College, November 10.

Speaking before 41 students and several chapter members and guests, Mr.

Emil Kitzman (right) Philadelphia ASTE chairman, chats with J. R. Miller of Beaver Tool & Engineering Corp., speaker at the chapter's November dinner meeting.

Williams traced the history of power transmission from 300 B.C. to the present. For illustration he used about 35 slides showing examples of early forms of power transmission.

Commenting on the slides, Mr. Williams pointed out the ingenuity of the inventors, while tracing the development of methods used today for intra- and inter-plant power transmission.

Joseph Sullivan, chairman of the Villanova student chapter of ASME, introduced the speaker.

At the conclusion of the meeting refreshments were served.

Students of the ASTE-sponsored Jig and Die Design class of Spring Garden Institute visited the Hunting Park plant of the Budd Co., November 24.

* * *

J. R. Miller, vice-president of Beaver Tool & Engineering Corp., presented "Practical Applications of Carbide Milling Cutters" to 220 members and guests attending the November meeting of Philadelphia chapter.

Emphasizing the fundamentals of milling, Mr. Miller gave his audience sound information on the procedure for an economical carbide milling job.

He discussed machines used, types of cutters, sharpening of cutters and the ideal milling cutter. He commented on speeds and feeds, cutter diameter, and horsepower required for a cut. He also spoke briefly of fixtures used and explained when a flywheel should be added to a milling machine.

A 35-minute question and answer period followed Mr. Miller's talk.

L. S. Paulsen, first vice-chairman, introduced the speaker. A. B. Luecke, membership chairman, and D. J. Hechinger, industrial relations chairman, reported on their committees' activities.

Coming Meetings

ALL CHAPTERS—January. Election of Nominating Committee. February. Election of chapter officers, delegates and alternates.

CENTRAL PENNSYLVANIA—January 15. Speaker: J. L. Schwab, Methods Engineering Council. Subject: "Methods—Time Measurements." February 16. Speaker: B. O. Hultgren, The Bellows Co. Subject: "Production Miracles Through Controlled Air Power."

CHICAGO—February 14, 8:00 p.m., Western Society of Engineers. Speaker: H. L. Stewart, Logansport Machine Co. Subject: "Fluid Power in Action."

CLEVELAND—February 10, Cleveland Engineering Society. Old Timers' Night Entertainment. February 22. Plant tour, Cuyahoga Works, American Steel & Wire Co.

ELMIRA—February 6, 7:00 p.m., Mark Twain Hotel. Speaker: W. H. Oldacre, president, D. A. Stewart Oil Co., Chicago, Ill. Subject: "Cutting Fluids and Tool Design."

ERIE—February 7, 6:30 p.m., Common Room, Gannon College. Speaker: Joseph Manuele, director, quality control, Westinghouse Electric Co., Pittsburgh, Pa. Subject: "Quality Control —A Tool for Management."

FAIRFIELD COUNTY—February 1, Stratfield Hotel, Bridgeport, Conn. Speaker: H. L. Stewart, Logansport Machine Co. Subject: "Fluid Power in Action."

GOLDEN GATE — January 17, Union League Club, San Francisco. Speaker: O. G. Seeds, sales manager, Cerro de Pasco Copper Corp. Subject to be announced.

PHILADELPHIA—April 10-14, Convention Hall and Commercial Museum. Tool Engineer's Exposition and 18th ASTE Annual Meeting.

TORONTO—February 1, Oak Room, Union Station. Speaker: Gordon Hall, Wallace Barnes Co., Ltd., Hamilton, Ont. Subject: "Springs in Industry."

TWIN STATES—February 8, 7:00 p.m., Trade Winds Cafe, Springfield, Vt. Speaker: Darle W. Dudley, gear development engineer, General Electric Co., Lynn, Mass., Subject: "Developments in Gear Tools and Gear Manufacturing Processes."

WATERLOO AREA (ANN ARBOR)—January 25. Dinner, American Legion Home, Saline, Mich. Speaker: Edward Bentzen, Ford Motor Co., Ypsilanti, Mich.

Bues Forms Company

Oakland, Calif.—Karl L. Bues, consulting manufacturing engineer and a former national director of ASTE, has organized the Bues Production Equipment Co.

A registered Professional Engineer, Mr. Bues has long been active in Golden Gate and West Coast ASTE affairs.

TOOLS OF TODAY

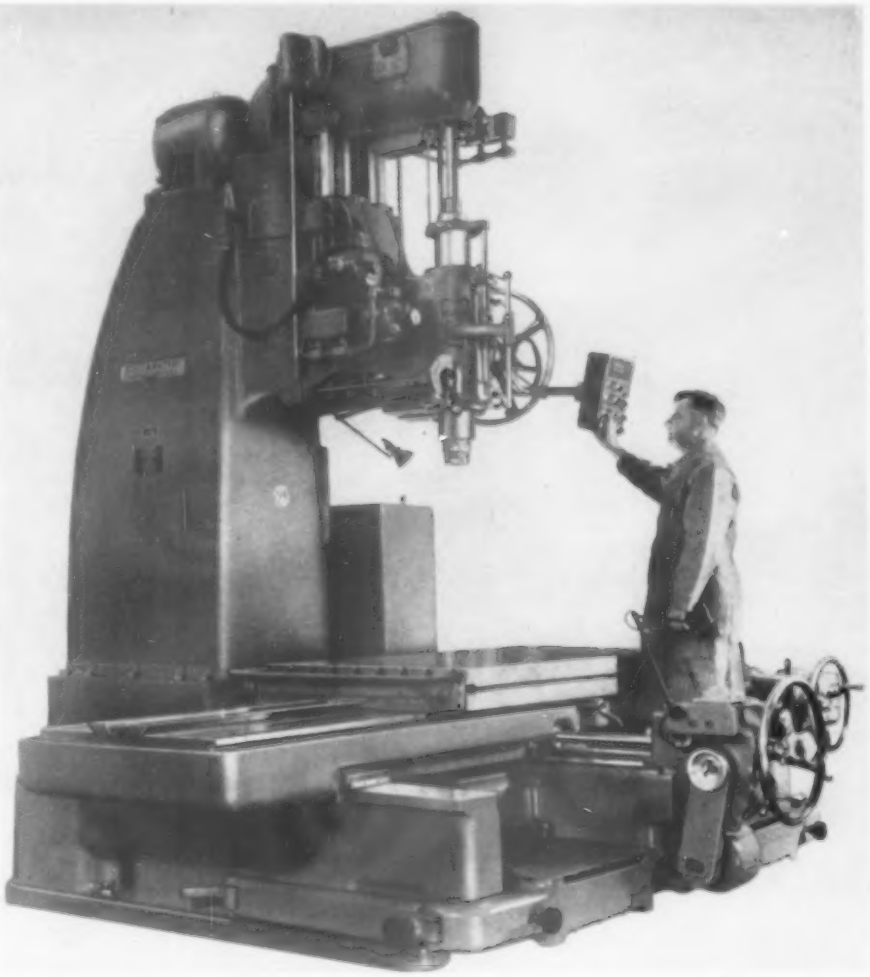
Largest Jig Borer Announced by Pratt & Whitney

What is said to be the largest vertical Jig Borer ever built was recently announced by Pratt & Whitney, Division Niles-Bement-Pond Co., West Hartford 1, Conn. Designated the No. 4-E, this 15½ ton precision machine is designed to locate and bore to 0.0001 in. accuracy with a workload of 2½ tons. Typical of P & W jig borers, the machine is of open-side construction to provide placing and for holding an unusually wide range of work.

The standard No. 4-E machine has a 36 x 72 in. rectangular table with longitudinal and transverse travel respectively 60 and 36 in. The maximum standard height from table top to spindle nose is 33 in.; however, columns 6, 10 and 14 in. higher than standard can be furnished to increase vertical capacity to a maximum of 47 in. Also, a combination rectangular and built-in 42 in. diam. rotary table, or a built-in 48- in. rotary table, can be furnished in place of the plain rectangular table.

The hardened, ground and lapped quill, 5½ in. in diameter, has 10 in. vertical travel with power feed up and down ranging from 0.0005 to 0.015 in. per revolution of the spindle which, in turn, takes tools as large as No. 5 Morse taper. Tools may also be held in the spindle with collets and a spindle nose cap. An adjustable dial indicator depth gage, with positive stop, is built into the spindle head for accurate boring to depth.

Electrical controls of the primary functions of the machine are concentrated in a pendent control station, located at the normal operating position yet adjustable to suit working conditions. In addition to the controls on the pendent, push buttons are also located on both carriage and table control brackets for controlling rapid power travel when positioning work laterally or longitudinally.

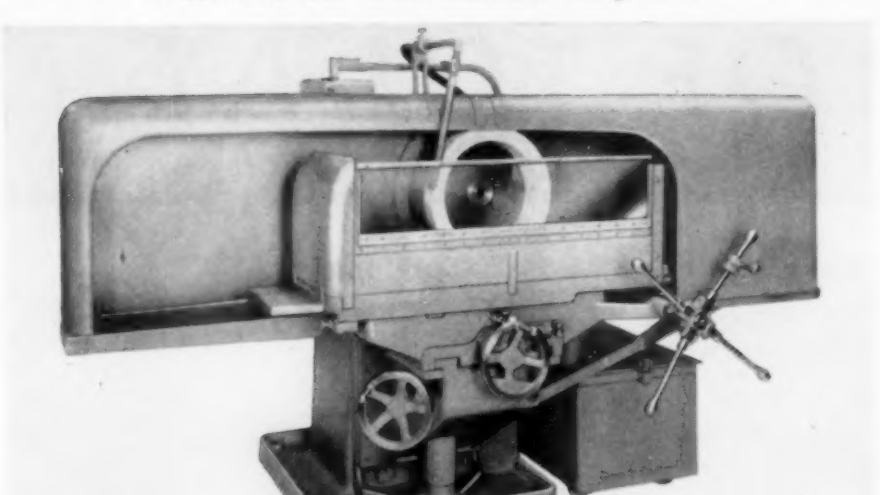


Above, the Pratt & Whitney No. 4-E Jig Borer, said to be largest of its kind. Below, spindle and control details.

Because of its large size as compared to other P & W jig borers, the 4-E machine is equipped with an improved type Pratt & Whitney Electrolimit measuring system in place of the standard end measuring system. An electric control cabinet, located at the right of the machine, is a separate unit and therefore eliminates transfer of heat to the machine. **T-1-1**

See page 60 for handy Tools of Today coupon.

Face Grinder With Motorized Spindle



A Face Grinder with a 15 HP, 900 rpm spindle which eliminates all pulleys and belts and furnishes an exceptionally powerful drive is announced by Abrasive Machine Company, East Providence 14, R. I. The spindle, which carries an 18 in. wheel, is mounted in pre-loaded ball bearings to insure long life and chatter-free operating.

Work surface of the T-slotted table is 13 x 36 in., adapting the machine to a wide variety of face grinding applications wherever flat or square surfaces are demanded. Work may be directly clamped to the table, which may further be provided with fixtures, magnetic chucks, or accessories. Among the latter is a motorized pulley grinding attachment which provides for face or rim grinding of practically any circular part.

The machine is of box-type construction, with enclosed elevating mechanism. The cross-feed wheel is graduated to 0.00025 in. for convenience in setting. The coolant tank, of 60 gallon capacity has a motorized pump and the table is provided with water guards designed to confine dirt, spray and grinding chips. The work area is further provided with a plexiglass front guard which provides adequate clear view of the work. Further details are to be had in a bulletin available on request, which gives full specifications. **T-1-2**

Guided Hand Tapper

The H. D. Herder Tool Specialties Co., 2424 Brook Dr., Kalamazoo, Mich., announce Model H.T. 250 Hand Tapper a bench-type tool designed for sensitive, precision small hole tapping. The tool, which is primarily designed for use by tool and die shops and light assembly production plants as well as by experimental and model shops, is supplied with four collets which handle standard tap shank sizes from No. 0 to ¼ in.

Guided accuracy insures right angle holes with reduced tap breakage. The swinging spindle arm may be quickly positioned for height, with maximum distance from base surface to bottom of top 6 inches. Two clamps for holding work are adjustable for various job applications. **T-1-3**

Use This Coupon for Complete Information

On Tools of Today Items Featured This Month

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T-1-18	T-1-19	T-1-20	T-1-21	T-1-22	T-1-23	T-1-24	T-1-25	T-1-26
T-1-27	T-1-28	T-1-29	T-1-30	T-1-31	T-1-32	T-1-33	T-1-34	T-1-35
T-1-36	T-1-37							

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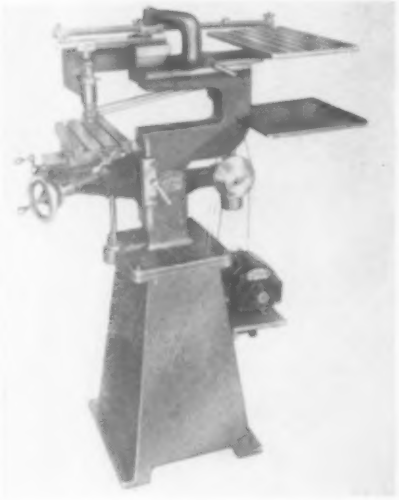
2-Dimensional Engraver

H. P. Preis Engraving Machine Co., 651 State Highway 29, Hillside 5, N. J., announces a Panto-Engraver for two-dimensional engraving. Of rugged design and designed for engraving and profiling in steel dies and molds, the open throat permits engraving to the center of a 30 inch diameter dial or 30 inch wide panel. Pantograph ratios range from 1:1 or full size to infinity.



The Pantograph, cutter spindle and spindle links are mounted in precision angular contact ball bearings to assure accurate assembly and easy adjustment for play or normal wear; also for greatest ease of movement for delicate and precise reproductions at all ratios. Six cutter spindle speeds range from 5000 to 14000 rpm, powered by a ¼ HP motor. The standard work table is 6 x 12 in. with three T-slots; however, an auxiliary work table 18 x 24 in. with four T-slots is available for engraving large panels or dials.

Maximum height of work is 6 inches, cross and longitudinal feed 6 and 6½ inches respectively. All dials are graduated in one thousandths of an inch. The cutter spindle is of collet design and collets are available from 0.100 to ¼ in. diameter for straight shank cutters in addition to the collet for standard tapered shank. It can be furnished as a bench model or floor model, the latter being 50 in. high with weight approximately 365 lb. Bend model is 28 in. high. **T-1-4**

Extra-Strong Tape

What is said to be the world's strongest tape with a pressure-sensitive adhesive is announced by Minnesota Mining & Mfg. Co., 900 Fauquier St., St. Paul 6, Minn. Designed for packing and made with glass, this tape is said to be especially valuable in strapping fibre-board cartons in addition to banding steel coils and pipes. As compared with the two earlier filament tapes by the 3M Company, which had tensile strength of 175 lb per inch of tape width, this latest product is said to provide 500 lb per inch of width. **T-1-5**

Gear Head Motors

A line of gear-head motors, by Robbins & Myers, Inc., Springfield, Ohio, features a complete range of

countershaft speeds for the powering of all types of electrically-activated devices.

Basically a standard motor with a self-contained gear reduction mechanism, the motor is available for single and double reduction requirements in ratings from 1/200 to ½ hp, in reduction ratios from 6:1 to 900:1, and in output torques from 1 inch-pound to 500 inch-pounds.

Countershaft speeds range from 833 to 8 rpm and, depending upon the motor frame size employed, the countershaft can be located in increments of 30 to 90 deg relative to a horizontal center line by relocating the gear head on the frame. **T-1-6**

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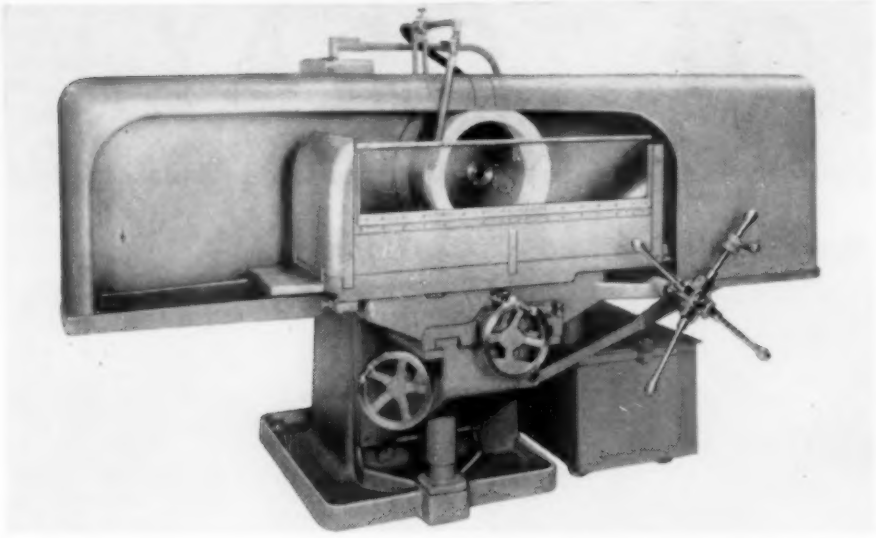

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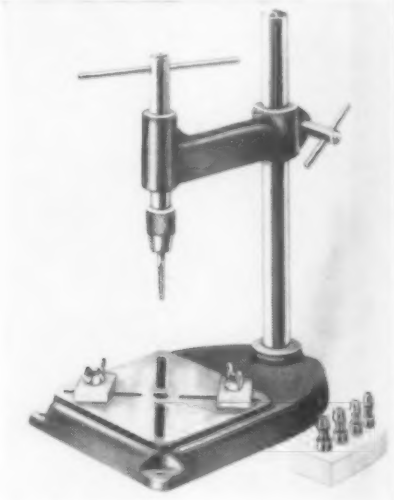

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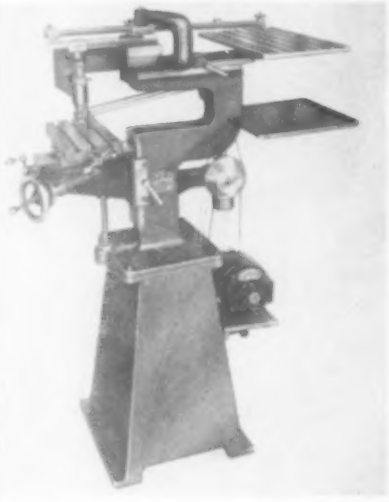

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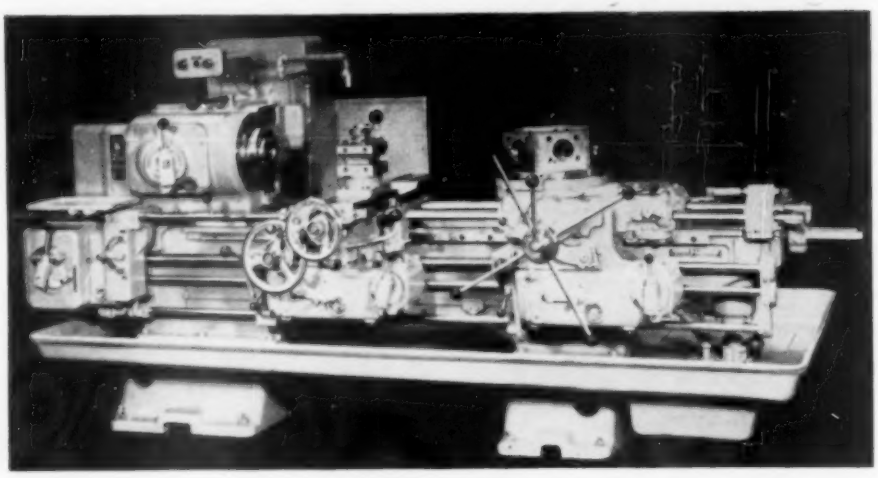
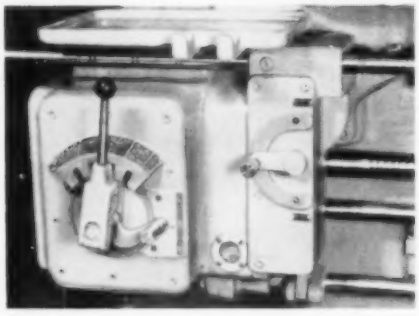
Saddle-Type Universal Turret Lathe





The Jones & Lamson Machine Co., Springfield, Vt., announce their Model 7A Saddle Type Universal Turret Lathe, with 2½ in. bar and 12 in. chuck capacity. This completely redesigned model, which weighs over 4½ tons without tooling, combines the many advanced construction and control features characteristic of the previous model, with improvements and refinements designed to provide the optimum in rapid, low cost, metal removal. The result is a rugged, versatile, easy to operate turret lathe said to be setting new standards for fast metal removal combined with repetitive accuracy.

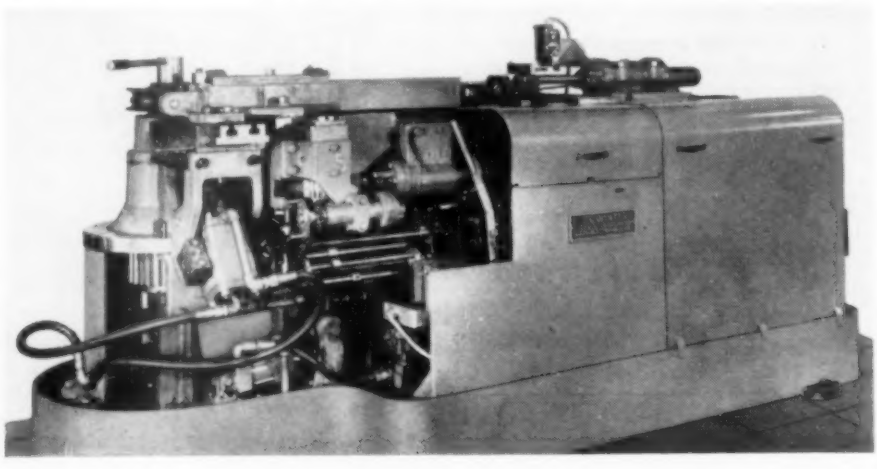
The over-all functional design gives special consideration to the accelerated demand for high surface speed metal removal. The design of the bed, in particular, emphasizes strength and rigidity and provides for increased facility in chip disposal.

Threading to maximum turning length with carriage or saddle is made possible by a full-length lead screw. An all-sliding gear, quick-change gear box with a single lever pitch selector, shown in smaller photo, provides a wide range of pitches. Both cross slide and saddle are equipped with power rapid traverse, and the turret is power indexed. Two ranges of twelve spindle speeds, 20 to 1000 rpm or 30 to 1500 rpm, are available, with a constant speed motor. Selection is made by a single lever speed selector. **T-1-7**

Tube Bending Machine

The Acme-Winter Corp., Buffalo 13, N. Y., announces a high speed hydraulic automatic universal tube and miscellaneous Bending Machine currently furnished in several sizes for bending up to and including 3 in. O.D. ¼ in. wall or larger die tubes of the same area. A short bending head allows the operator to work in front of the machine.

The machine bends either right or left hand with the standard dies, can be furnished with hand control and automatic mandrel ejector and special extension tables and adjustable gages to suit customers' needs. The standard machines are equipped with six automatic stops for various degree of bends, and are indexed automatically. **T-1-8**



Power Screw Driver

The "Shakeproof" Power Screw Driver recently introduced by Shakeproof Inc., a division of Illinois Tool Works, 2501 No. Keeler Ave., Chicago 39, Ill., has been specially engineered for high-speed mass production lines and features hopper feeding, driving speed of more than one screw a second in the smaller sizes, uniform tightening torque and a minimum of "down time" for conversion or adjustment.

Practically all types and styles of screws in sizes ranging from No. 1 X ⅛ in. to ¼ X ¾ in., are readily accommodated by the specially designed hopper and driving spindle. Installation of the unit consists merely of plugging into a 110 volt outlet and connecting to the compressed air supply line.

Operation is said to be positive and to greatly minimize operator fatigue. The operator places screws in the hopper, locates the part to be fastened beneath the driving spindle and lightly presses the air pedal to drive the screw. The simple hopper feed positions each screw properly for traveling down the track to the bit, where the screw is firmly held in place until one or two threads are engaged. As the desired torque is reached the clutch disengages automatically, the spindle returning for another screw when the operator releases the foot pedal.

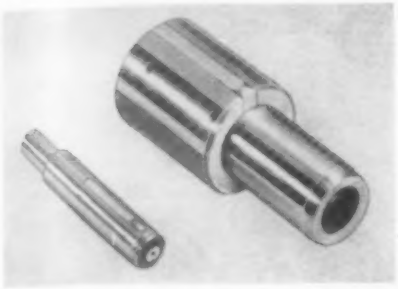
Breaking, or scarring of work, is eliminated because the automatic clutch prevents over-tightening of the screw. Another important feature is the simple mechanism which enables the operator to release a jam caused by a wrong sized screw without delay or damage to the machines, which are available in floor and bench-type models. **T-1-9**

Protective Gage Lubricant

A protective lubricant for gages and precision tools—Gage Lube, by Protective Coatings, Inc., Box 3985, Detroit 27, Mich.—is said to not only greatly extend useful life of precision instruments, plug and thread gages, but to act as a rust inhibitor. It may be applied by brush or by dipping leading edge of gage into solution, as desired. **T-1-9-A**

Contact Air Spindles

Blade contact-type Air-Spindles for column and dial type Precisionaires, announced by the Sheffield Corp., Dayton 1, Ohio, are designed to enable an instrument type check to be made of practically any hole regardless of finish, interruptions or size. This permits the accurate plotting of charts for quality control.



Spindles consist essentially of a hardened steel body slightly smaller than minimum hole size, with a hardened steel contact blade either pivoted or floating, the action of which controls the flow of air through the jets. Blades also may be chromed or have tungsten carbide or other wear resistant material inserts or surfaces.

Such spindles can be made with one or more blades and with different arrangements of jets and spring-loading of the blades, as required for true or average diameter by the particular application. Minimum size of single blade spindles starts at approximately 3/8 in. diameter, depending upon application.

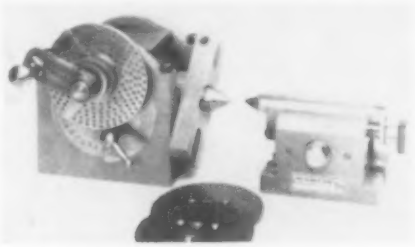
Holes with surface finish rougher than 75 to 100 micro inches can be measured accurately for out-of-round and taper, as well as for diameter. Readings for these three conditions and dimensions are said to be entirely unaffected by even the coarsest surface finish, and interruptions such as oil holes of grooves, keyway slots, ports, do not affect the accuracy of readings. **T-1-10**

Hand Hardness Tester

Fabricated plastics or non-ferrous metal parts can now be quickly tested with the Impressor, a hand hardness tester by Barber-Colman Co., Rockford, Ill. Suitable for spot checking of stock, this tool is designed for use in any position and in any area which will permit entry of the operator's hand. A conveniently located dial, which indicates material hardness, gives accurate readings even when the Impressor is used by an inexperienced operator. **T-1-11**

Tilting Dividing Head

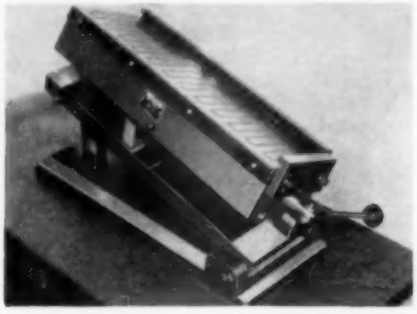
A dividing Head said to provide wide latitude in selecting various divisions to meet specific requirements is announced by Marvin Machine Products, Inc., 414 Ford Bldg., Detroit 26, Mich. A small unit swinging about 4 1/4 in. and weighing only 15 lbs., it nevertheless embodies practically all the essential features of larger heads and, within its size limits, will do identical work.



The unit, which comes with three index plates, each having 6 sets of holes, will tilt 5 deg below horizontal to 30 deg past vertical axis—total 125 degrees. The tailstock has two pins, which align it in position with the headstock, and is vertically adjustable for tapered work. The head has a standard 40:1 ratio worm drive, and spindle nose has No. 2 Morse taper socket and 1 in. x 10 threads. **T-1-12**

Magna-Sine Magnetic Chuck

The Omer E. Robbins Co., 5722 Twelfth St., Detroit 7, Mich., announces Magna-Sines designed for use on production-type surface grinders. This series has a permanent-magnet chuck measuring 7½ in. deep by 20½ in. long and can be used for either wet or dry grinding.



When in closed position, the Magna-Sine is used as a conventional magnetic chuck for holding parallel work. For angular work, either single or compound angle, it can be quickly and accurately set up with standard gage blocks by the sine bar method. Thus, the Magna-Sine becomes a versatile magnetic chuck, available for production work, that will eliminate many costly and complicated special work-holding fixtures for angular work. Complete information is available in a company bulletin. **T-1-13**

Metal Disintegrator

Clinton Machine Co., Clinton, Mich., announces a Metal Disintegrator developed for removing broken taps, drills and, among other things, broken-off dowel pins from blind holes without distorting the threads or holes, and for cutting shaped holes in dies and machine components.

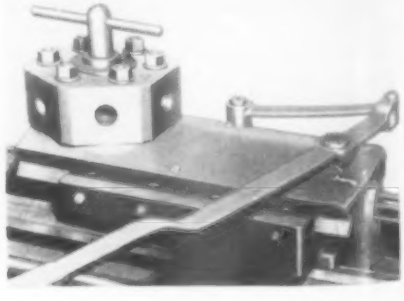
The tool, which is self feeding when switched on, operates by the simple process of chucking in a drill press and selecting the proper size electrode. It is said to remove broken taps from 0.080 to 1 in.; also, that shapes of holes cut in hardened steels or carbides include rounds, ovals, open or blind squares, hexagonal and pinion shapes. **T-1-14**

Hand Lever Hexturret

Enco Manufacturing Co., 4522-24 W. Fullerton Ave., Chicago 39, Ill., announced the Hand Lever Hexturret as a companion to the company's Enco Pilot Wheel Hexturret.

This bed turret, herewith illustrated, is available for lathes from 9 to 12 in. swing and can be provided with 4¼ or 6½ in. working travel. As with the pilot wheel model, the slideways and bearing surfaces are hand scraped and spotted, and index mechanism is hardened.

Because of rigid top side clamping and general high accuracy, these turrets are particularly adaptable for close tolerance work in plastics, aluminum, brass and mild steel. Further described in company Bulletin No. 410. **T-1-15**



Cross Machine for Gear Cages

While originally designed and built for a large automobile manufacturer for machining planetary gear cages, an Automatic Cycle Machine Tool, by the Cross Company, 3250 Bellevue Ave., Detroit 7, Mich., is adaptable for a wide range of similar work.

Said to require only one operator, the equipment, drills, taps, reams and counterbores 75 parts per hour at a claimed efficiency of 100 percent. Output at this rate of efficiency is attained because the machine sets the pace for the operator, who is only required to load and unload while the machine is cutting.

Feed and rapid traverse are hydraulically operated, and multiple operatives on opposite sides of the part are handled simultaneously in each station as a result of double loading. The index table is a 6-station, fluid drive type, and power clamping is provided for the work-holding fixtures. **T-1-16**

Combination Drill-Tap

Mohawk Tool Company, 21647 Dequindre Road, Hazel Park, Mich., announces a precision combination Drill-Tap, of sub-land design, that drills and taps in one operation. Applications are on through holes only, such as flanges. The drilling flutes, though smaller in diameter than the tap, are greater than the root diameter of the tap and are circle ground their entire length.

On completing the hole, drill serves as a pilot for the start tap. As the drill becomes dull and end sharpening is necessary, the tapping flutes are ground off an equal amount to retain drill clearance. Such sharpening can be repeated the entire length of the tool, which is available in 16 standard sizes from 0.201 to 0.6875 in. drill with taps ¼ to ¾ in., NC and NF types. **T-1-17**

Centerless Brushing

Said to result in cost and time savings on cylindrical parts, a method of "centerless brushing", by the Osborne Mfg. Co., 5401 Hamilton Ave., Cleveland, Ohio, has been applied to a Cincinnati centerless grinder for finishing of automotive pistons. As claimed, centerless brushing not only removes grinding residue but also blends the sharpness of the surface and thereby saves the usual preliminary wear of the piston in the cylinder.

The Osborne brush used is 20 in. in diameter x 6 in. face, and the work is gravity fed from a magazine type chute. As now processed, the pistons are machine ground and then "centerless brushed" for finish. **T-1-18**

Metal Cut-Off Machine

Positive drive, flexibility and ease of operation, a self-centering vise adaptable to most contours and shapes and operator safety, all at low price, are features claimed for the Stone "Swing-Cut" Abrasive Metal Cut-Off Machine announced by the Stone Machinery Co., Inc., 357 Fayette St., Manlius, N. Y.

Capacity cuts up to 3 in. solids and 4 in. pipe in both ferrous and nonferrous materials are obtained through the elimination of all belt drives with a 5 hp geared-in-head motor, an engineering development said to produce more work than the average 10 hp motor of V-belt drive construction.

Rigid construction, plus positive holding to increase wheel life, provide for straight cuts to close tolerances with a minimum of burr. Cutting at 2380 rpm spindle speed reduces the possibility of burn in the metal and eliminates the undesirable necessity for wet cutting in many materials. **T-1-19**

Alloy for Precision Casting

Cerrocast, an alloy said to be of reasonable hardness, negligible shrinkage and extensive melting range, has recently been introduced by Cerro de Pasco Copper Corp., 40 Wall St., New York 5. Cerrocast is a non-eutectic alloy of bismuth and tin having the following physical properties: melting range, 281 to 338 deg F; yield temperature, 302 deg F; weight, lb per cu in. 0.296; Brinell hardness, 22; shrinkage 0.0001 in. per in.

It is especially suitable for use in precision casting—lost wax process—and, because of its long melting range can be coined readily to accurately reproduce the shape, dimensions and fine surface details of the master pattern. Cerrocast is also said to work satisfactorily in spray guns and for low-temperature soldering of pre-tinned metal parts. Further details are available from the manufacturer. **T-1-20**

Dial Snap Gage by Nilco

A Dial Snap Gage for crankshaft and close shoulder work, by the Nilsson Gage Co., Inc., Poughkeepsie, N. Y., features the Nilco Radius Guides which are here adapted to the company's standard dial snap gages.

These radius guides clear the maximum fillet and permit the gage to check as close to the shoulder as the fillet permits. This arrangement provides for detecting any hour-glass condition or oversize fillets resulting from radius breakdown of the grinding wheel.

Light in weight, portable and specifically designed for crankshaft checking, with indicator graduated in 0.0001 in., the gage permits repeated reading without rocking back and forth. Because of the rotable assembly it is further possible to extend the indicator back away from the work to clear any eccentric throw that might cause interference.

T-1-21

Molded Chemlon Available

The Crane Packing Co., 1800 Cuyler, Chicago, Ill., announces that its chemically inert packing materal, Chemlon, is now available in molded form in a wide variety of shapes. In the molded form, it is said to be resistant to acids or alkalis, and to stand up for long periods of time under conditions never before successfully sealed by packing. It is effective to temperatures of 450 deg F.

A special molding process, resulting in high flexibility, is particularly helpful in installation of the packing rings. When split, they can be twisted and placed directly on the shaft without the necessity of completely removing the gland. Another feature of the molded styles is the exceptional electrical properties of the material, a combination of low power factor and low dielectric constant making it an excellent insulator for high frequency transmission lines where low loss is a rigid necessity.

Among the many molded forms now furnished are washers, bushings, rings, self sealing "V" cros-section rings, ring gaskets, and jacketed (French) gaskets. Numerous special shapes can also be molded for individual requirements.

7-1-22

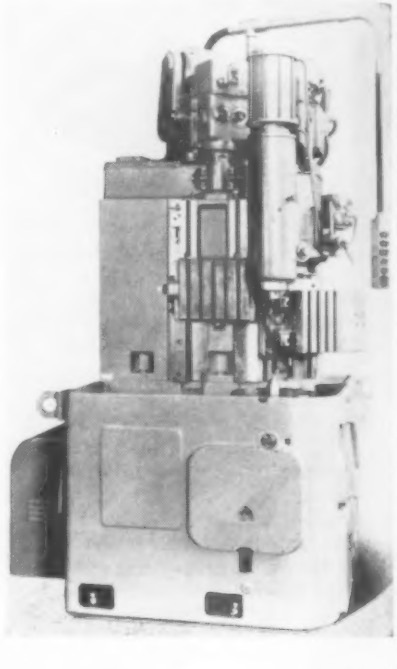
Collet Holding Unit

Developed for use on the Rouse Hand Miller but also suited to other machine tools, the No. 9 Collet Holding Unit, by H. B. Rouse & Co., Chicago 14, Ill., is especially suited for such operation as spline cutting, cutting teeth on small pinions, slotting, slitting and similar light milling operations. It can also be used as a jig for various drilling operations, or as a basic part of other fixtures.

The unit consists of a right-hand collet holding head—9A—and an adjustable center unit—9B—for holding longer or larger work on centers. The 9A head unit, which is furnished with index plate in blank and which takes standard No. 4 Cataract collets, may be purchased separately. **T-1-23**

Vertical Production Lathe

A Vertical Automatic Production Lathe of unit construction, designed for turning, boring and facing work has been developed by the Reed-Prentice Corporation with the object of taking full advantage of high speed negative-rake cutting tools. The machine is controlled by a central cycle timer which, after the work has been chucked, starts the spindle, also starts each slide to move at its appointed time and, when the last tool has completed its work, stops the spindle.



The slides are independent of each other and may be set to go through their motions at any time during a machine cycle. Feed boxes for each slide are identical and each is complete with its motor, hydraulic system for shifting the clutches, and solenoid operated valves. Feed boxes permit traversing of tools to cutting position, feed, stop, dwell, return and then stop for removal of workpiece.

For setting up, all movements may be controlled by plainly marked push-buttons conveniently located in a pendant panel, and the slide may be moved at feed rate or rapid traverse in either direction as required. Tools may be fed into cut and actual work performed as a final check on correct tool set-up.

The standard machine is equipped with one each turning slide and facing slide, the latter arranged to swivel, and a tailstock which may be replaced with a boring head when needed.

The lathe is designed to permit adding of an extra slide and attachments for taper turning, forming, and other types of work may be supplied as required. Further information may be had from Reed-Prentice Corporation, Dept. V-37, Worcester 4, Mass. **T-1-24**

Precision Tool Grinder

A universal Tool Grinder featuring clean design, sturdy construction and a claimed accuracy of 0.0002 in. is currently being shown by Nife Inc., 165 Broadway, New York 6, N.Y. A product of Jungner, Stockholm, Sweden, the machine is built to tolerances of one thousandth of a millimeter and all attachments and accessories are held to a comparable standard of precision.

The machine is designed for counter-grinding-that is, against the cutting edge—and will take practically any cutting tool setup from smallest end mills, taps, holes and reamers through to mounted gang cutters, as well as turning tools. The machine is further adapted to carbide grinding and to form and toolroom grinding, as suggested by the smaller photo.

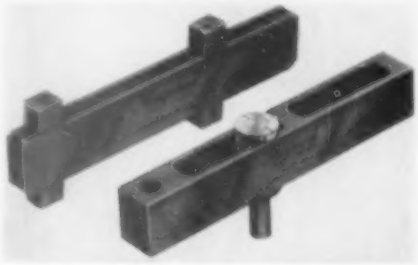
The dividing head, which is universal, is provided with a sine bar for accurate angular setting, and clearance angles are also accurately established with the graduated scale without resort to tables or involved calculations. Moving parts are shielded against dust and are further protected by a built-in exhaust system. **T-1-25**

See page 60 for handy Tools of Today coupon.

Adjustable Gages

Maywood Industrial Engineering, 36 New Dwight St., Springfield, Mass., announces a Double Duty Gage which combines an adjustable flat snap gage and flat plug gage. The adjustable members of this gage—shown in upper illustration—can be independently set and immovably locked in place for both "Go" and "No Go" sizes. A range of 0 to 8 in. and 0 to 9 in. for the flat snap and flat plug, respectively, is covered by a series of five gages.

Also, by this company, a Flush Pin Gage—lower illustration—which can be made up from a number of standard components. The gage pins can be adjusted 0.250 in. and 0.500 in. for the smaller and larger sizes respectively, and a range of ½ min. to 3½ in. max. is covered by a set of only eight separate pin assemblies. The gage bodies cover a range from 4 in. min. to 10 in. max. Both gages have "Pentrate" blue-black, rust-resistant finish. **T-1-26**



"EZ-Pul" Die Extractor

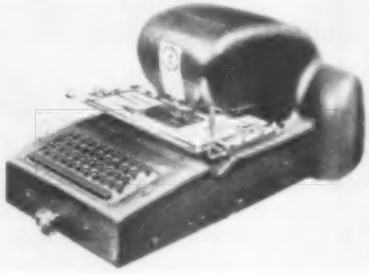
Punch press down-time during removal of pierce die inserts is said to be reduced to an absolute minimum through use of the EZ-Pul, a tool announced by L. C. Ball Associates, Inc., 2276 CA National Bank Bldg., Detroit 26, Mich. This pierce die "button" extractor requires only four simple steps to pull straight or taper hole inserts without removing dies or die sections from press. The tool is also useful for quick removal of bearings, bushings, liners and sleeves.

Two standard sets are available to pull inserts from 0.2031 through 0.7031 in. Special extractors for individual problems may also be had. Also available is a tool, recently developed, for pulling punches with patented lock known as the "EZ-Pul" Punch Puller. Bulletin No. 201 fully describes these products. T-1-27

Metal Marking Typewriter

An electrical metal marking typewriter—the Automark, by Cadillac Stamp Co., Dept. MA-10, 2138 Riopelle, Detroit 7, Mich.—is designed for metal marking as well as for intaglio marking on leather, wood, plastics and other materials. It can further be adjusted to mark steel up to ½ in. thick—that is, before hardening.

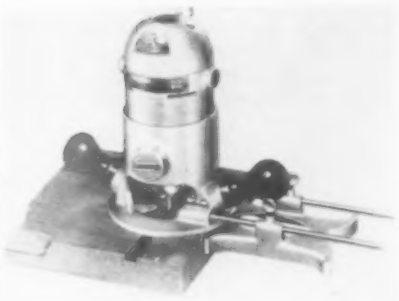
Primarily developed for the detailed marking of name plates, the Automark is all-electric with automatic table feed. The letter wheel is made from alloy tool steel and type sizes from 1/32 to ¼ in. are interchangeable, with wheels readily interchanged. Operated like a conventional typewriter, it is said to deliver name plates with clear cut letters produced by an easy touch on the keys. T-1-28



See page 60 for handy Tools of Today coupon.

Router by Stanley Tools

Stanley Electric Tools, New Britain, Conn., announces the Stanley No. 28 Router-Shaper, designed for speedy and accurate woodworking operations basic in furniture construction. Depth of cut is regulated by raising or lowering the motor unit on the casing, which is threaded for 1/16 in. adjustment per one complete turn.



The tool is powered with a ½ HP 18000 rpm motor with over size shaft for smooth cutting and greater power. The motor is of universal type operating on either AC or DC current, 60 cycles or less, and an oversize ventilating system keeps the motor cool and work surface clean. Attachments can be furnished to adapt the router to bench shaper, bench grinder, toolroom grinder, power plane, overarm router and dovetail cutter. **T-1-29**

Solenoid Valve by Ross

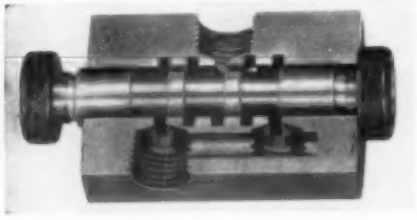
A compact, quick-operating Air Control Valve, by Ross Operating Valve Co., 120 E. Golden Gate Ave., Detroit 3, Mich., is a direct operated unit available in both normally open and normally closed models.

Using the standard Ross solenoid and made in ⅛ in. pipe size, straight-way or 3-way with in-line, bottom or panel mounting, its instantaneous action should prove useful in a wide variety of industrial applications.

T-1-30

Hi-Cyclic Air Valve

The Beckett-Harcum Co., Wayne Road, Wilmington, Ohio, announces the Hi-Cyclic Air Valve which, while it functions the same as any operating valve, will also control the stroke of an air cylinder within 0.001 in.; stop and return the stroke at any point without overtravel; control the speed of stroke in either direction; reciprocate mechanically or electrically; control the pressure in both ends of the cylinder; and affect a marked saving in air.

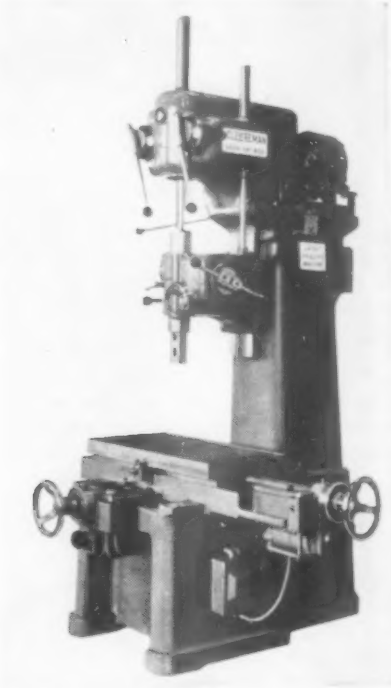


The illustration shows a cut-away view of the Model B valve, which forms the basic component of all other Hi-Cyclic air valve models. Intake air flows to both ends of the piston through dual pressure ports, equalizing the pressure on the piston and providing balanced operation. The valve operates on a slight by-pass of lubricated air, which floats the piston, providing extremely fast, effortless operation with no lag time.

The valve is said to operate on air line pressure as low as 1 psi or as high as can be delivered. **T-1-31**

Layout Drilling Machine

A Layout Drilling Machine, by the Cleereman Machine Tool Co., Green Bay, Wis., is designed to handle that in-between class of work which requires more accuracy and facility than is possible with a drilling machine and yet does not require the extreme precision of a jig borer. The machine which is convenient for drilling, boring, tapping, reaming, milling and similar operations, is especially applicable to tool work, die making and plastic casting molds within its designated limits, as well as to experimental work and jigless production of small lot manufacturing.



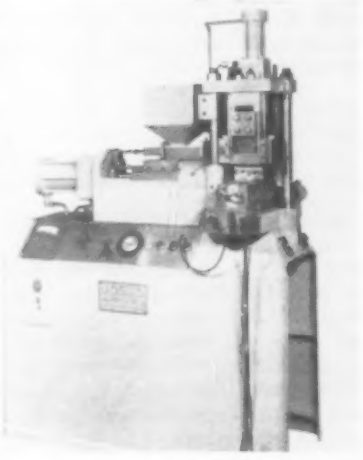
The machine has a combination boring and drilling spindle with No. 4 Morse Taper with lifetime lubrication. A spindle binder on the sliding head, and a retaining key slot in the spindle nose, provide for milling operations. The sliding head has a friction type feed clutch with automatic adjustable depth "kickout," and the spindle is counterbalanced in a manner that eliminates backlash between the feed rack and pinion.

Saddle and table movements are controlled by hardened and ground precision lead screws accurate to 0.001 in. in any inch and a cumulative error said not to exceed 0.001 in. in 24 in., with 6-inch diameter micrometer dials graduated to 0.001 in. and verniers to 0.0001 in. With screws of this accuracy and the alignment tolerances held on the machine, work tolerances should be easily held within 0.001 in. per foot. The machine is sold through the Bryant Machinery & Engineering Co., 1400 W. Madison St., Chicago 6, Ill. **T-1-32**

See page 60 for handy Tools of Today coupon.

Plastics Molding Machine

A production machine for molding of plastics products, by Moslo Machinery Co., 2443 Prospect Ave., Cleveland 15, Ohio, employs a self-positioning lower mold section, one-half of which can be cleared and reloaded while the other is engaged in the molding cycle. The machine illustrated is "tooled" for the production of molded cord plugs, one of the applications found especially advantageous to the electrical industry.

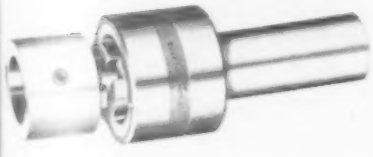


Called the "Duplimatic", the Moslo Molder incorporates a hydraulically operated rapid-traverse bed. The lower mold section, twice the size of the upper, has a complete duplicate set of cavities and is mounted on the automatic positioning bed. After loading, the mold shuttles and, in the interval required for curing, the operator loads the opposite molds. The cycle repeats.

The machines are built in 2, 3 and 4-ounce capacities, with casting areas from 20 to 40 square inches. Larger machines can be built to order. Complete details may be had in company bulletins. **T-1-33**

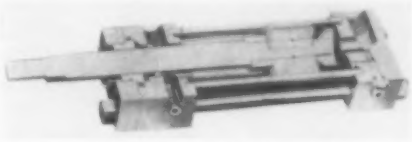
Tool-Flex Line Expanded

The line of Tool-flex Holders, by Burg Tool Mfg. Co., 3743 Durango Ave., Los Angeles 34, Calif., incorporate neoprene inserts which separate the rigidity of the tool holder body from the actual tool and allows the latter to follow its own alignment with a minimum of parts—actually only four—and what is said to be a maximum of durability. These positive drive holders are adaptable in any position and available in any type shank or collet. Made in both reamer and releasing tap holders, of which a latter type is shown, these Tool-flex holders can also be had in extremely small outside diameters for close-center work. **T-1-34**



Hydraulic Cylinders

Miller Motor Company, 4027 N. Kedzie Ave., Chicago 18, Ill., announces that they are in production on Hydraulic Cylinders of 10 and 12 in. bore and that deliveries of these large cylinders may now be made from stock.



These cylinders, which conform to the J.I.C. Hydraulic Standards for industrial equipment, and which are further described in Miller Bulletin H-104, are designed for pressures 2500-3500 psi and are inspection-tested at 5000 psi.

Available in single and double rod end styles, and in a choice of piston and piston rod seals for different applications, the cylinders have non-breakable solid steel heads, caps and mountings. Piston rods are hard chrome plated. The cutaway view shows general construction and piston sealed with the Miller automotive type step-cut piston rings. They can be furnished with a piston cup piston seal, either being optional. **T-1-35**

(Continued on page 80)

North East West South IN INDUSTRY

Vanadium-Alloys Steel Co. has announced the appointment of **Charles W. Wiegel** as general manager and **Robert E. Shoup** as general superintendent of its Colonial Steel div., Monaca, Pa.

The Rockwell Manufacturing Co. has acquired the automatic air-hydraulic drillhead formerly manufactured by the **Cleveland Republic Tool Corp.** It will be added to Rockwell's present line of Delta-Milwaukee power tools.

F. P. Taugher has been appointed manager of engineering for the **Westinghouse Electric Corp.'s** Industrial Control Div., Buffalo. For the past five years, Mr. Taugher had been engineering and service manager in the company's New England district.

Recent announcement was made of the election of **Elmer F. Franz** as treasurer of **The Yale & Towne Mfg. Co.** Mr. Franz succeeds **Fred Dunning** who now devotes full time to his responsibilities as executive vice-president and secretary.

At its recent annual meeting, the **Welding Research Council** elected **Dr. C. A. Adams** honorary chairman. Dr. Adams had been chairman of the Council since its beginning. **H. C. Boardman,** director of research, Chicago Bridge and Iron Co., was elected chairman; and **Dr. A. B. Kinzel,** president of Union Carbide and Carbon Research Labs., Inc., vice-chairman.

John P. Roche, vice-president of Heppenstall Co., Pittsburgh, has been named president of the **Machine Knife Association** at the group's annual meeting held recently in New York.

Assets of **The O.K. Tool Co.** have been purchased by the **William & Hussey Machine Co.,** Wilton, N. H. Alfred L. Marshall continues as general manager of the acquired firm, which will operate as a division of the parent company.

The Ready Tool Co., Bridgeport, Conn., recently acquired patent, manufacturing and sales rights of the Barter-Ritco reversible grinder dog, formerly manufactured by the **Rhode Island Tool Co.** Machinery and equipment involved will be transferred to the Bridgeport plant.

Frank A. Schotters has been named operations manager, parts div., **Reynolds Metals Co.** Prior to accepting his present position, Mr. Schotters was vice-president in charge of operations at The Trailmobile Co.

Charles E. Rice has been appointed general manager of sales by **Jessop Steel Co.** Mr. Rice previously was manager of sales for the Pittsburgh territory.

Size Control Co., and Walsh Press & Die Co., divisions of **American Gage & Machine Co.,** recently opened offices at 3344 W. 105th St., Cleveland, Ohio.

Non-Ferrous Perma Mold, Inc., a company jointly owned by the **Barnes Mfg. Co.,** Mansfield, Ohio, and the **Non-Ferrous Die Casting Co.,** Ltd., London, England, has been incorporated under the laws of Ohio, with factories in Mansfield.

The company, which has brought a number of special technicians from Britain, specializes in techniques in the art of permanent-mold casting.

American Machine and Foundry Co. has purchased the properties and assets of **DeWalt, Inc.,** Lancaster, Pa., manufacturers of radial saws for high-speed cutting.

A management engineering firm, **Lester, Hankins and Silver,** specializing in the management, distribution and sales problems of manufacturers and distributors of machinery, equipment and technical products, has been established at 1605 Race St., Philadelphia, and 140 Cedar St., New York. **Bernard Lester** formerly was connected with Westinghouse and originator of that company's Machine Tool Forum; **Frank W. Hankins** has been active in marketing research and sales counselling for 25 years; and **John A. Silver** formerly was director and executive vice-president of the F. J. Stokes Machine Co.

Elections by the board of directors of **Allegheny Ludlum Steel Corp.** have made **H. G. Batcheller,** company president, chairman of the board. **E. B. Cleborne,** formerly executive vice-president, succeeds Mr. Batcheller as president; **Edward J. Hanley,** vice-president in charge of finances and treasurer, assumes Mr. Cleborne's position; **Clark W. King** becomes treasurer, and **T. Ames Wheeler** was named to the newly-created office of controller.

William E. Ruder, research metallurgist for General Electric Co., who resigned as a director, was awarded the Allegheny Ludlum Merit Award consisting of a citation from the directors, the "President's Medal of Merit" and $1,000 cash for his work on General Electric-Allegheny Ludlum cooperative research committee on magnetic materials and his services within the board.

To stimulate advancements in the die casting industry, an award program has been set up by the **American Die Casting Institute**. Made possible through a special fund donated by the **Doehler Jarvis Corp.**, it calls for a cash award of at least $500 and an appropriate plaque to be presented annually for the most noteworthy contribution to the industry. Winners will be selected by the Institute's board of directors from nominations submitted between Jan. 1 and April 1 each year. Activity areas to be considered are technical achievements, advancements in plant operation and activities in the field of public relations.

Appointment of **A. M. Shaw** as assistant manager, pump and compressor merchandising division has been announced by F. J. Whelan, vice-president, **Worthington Pump and Machinery Corp.**

Arthur J. Renz recently has been named field engineer on precision spindle applications for the **Pope Machinery Corp.** Mr. Renz, a graduate of Massachusetts Institute of Technology, was associated with the General Electric Co. prior to joining Pope.

Morse G. Dial and **Kenneth H. Hannan** have been elected director and secretary, respectively, of the **Union Carbide and Carbon Corp.** Mr. Dial, a vice-president of the company, formerly was its secretary and Mr. Hannan previously served as assistant secretary and treasurer.

Coming Meetings

Jan. 16-19, first Plant Maintenance Show, Auditorium, Cleveland. **American Society of Mechanical Engineers** and **Society for Advancement of Management**, are co-sponsors of program to be held concurrently.

Mar. 28-31, National Plastics Exposition, Navy Pier, Chicago.

Apr. 4-8, National Production Exposition, sponsored by **Chicago Technical Societies Council**. Stevens Hotel, Chicago.

Apr. 10-14, Tool Engineer's Industrial Exposition, sponsored by the **American Society of Tool Engineers**. Convention Hall and Commercial Museum, Philadelphia.

Apr. 24-27, National Packaging Exposition, sponsored by the **American Management Association**. Navy Pier, Chicago.

Apr. 25-26, Annual Metal Powder Show, Book-Cadillac Hotel, Detroit.

OBITUARY

Alexander Nimick, Sr., works manager of Colonial Steel div., **Vanadium-Alloys Steel Co.**, died recently. Mr. Nimick had been associated with Colonial Steel for 35 years and a director of Vanadium-Alloys since 1932.

THE TOOL ENGINEER'S *Service Bureau*

Alloy Steel

"How to Specify and Buy Alloy Steel with Confidence" emphasizes importance of careful selection, positive knowledge of properties of the steel, accurate heat treatment for the right alloy for the job; points up major considerations in selecting and specifying. *Joseph T. Ryerson & Son, Inc.*, P. O. Box 8000A, Chicago 80.

Arc-Welding Accessories

Brochure GEC-253A contains descriptions, specifications, prices of more than 150 accessories including electrode holders, and carriers, tungsten electrodes, ground clamps, brushes, cleaning tools and protective aids. *General Electric Co.*, Schenectady 5, N. Y.

Band Knives

L. S. Starrett Co., Athol, Mass., announces addition of "Fast-Kut" band knives to its line of precision tools in folder containing outline of tools' uses and advantages plus price lists for straight edge, single or double bevel, and scallop and wavy edged band knives.

Clamps

Seventy-two page brochure shows line of jack locks, fixture clamps and standard details plus fixture clamp recently developed for clamping a casting through bored hole onto pilot plate; includes photos, diagrams and specifications and price lists. *Morton Machine Works*, 2421 Wolcott St., Ferndale 20, Mich.

Collets

Catalog No. 17 illustrates special tools as expanding mandrels, special spring chucks, milling machine adapters, and others, in addition to standard line of screw machine collets, advantages accompanying each illustration. Specifications and price lists of collets and fingers for numerous manufacturers' machines. *Sutton Tool Co.*, Dept. TE, Sturgis, Mich.

Cutting Fluid

Performance report, 749, by a customer-user of "Lusol" presents a case study based on tests on forged steel valve bonnets; includes comprehensive charts comparing tool life, cutting speeds and costs. *F. E. Anderson Oil Co.*, Portland, Conn.

Data Sheets

Brochure includes specifications, design factors, applications plus information on ordering concerning shims, locknuts and stampings, major products of *Laminated Shim Co., Inc.*, Glenbrook, Conn.

Die Sets

Twenty-four page catalog gives specification and price lists with accompanying dimensional drawings of line of die sets and accessories. *Standard Die Set Manufacturers, Inc.*, Providence 7, R. I.

Dry Lubricant

Bulletin No. 52 describes "Molykote", extreme pressure lubricant and anti-seizing compound, stressing uses and technical notes including chemical and thermal stability, electrical properties and corrosion tests. *The Alpha Corp.*, Greenwich, Conn.

Duplicating

Forty-page catalog No. 49-15 discusses Di-Acro system of die-less duplicating, and how it works, in addition to information on line of rod parters, benders, brakes, shearers and other equipment including the company's recently introduced power shear. *O'Neil-Irwin Manufacturing Co.*, 375 Eighth Ave., Lake City, Minn.

Gages, Pressure

Extensively illustrated folder shows useful applications by users of company's mechanical pressure gage; includes prices, dimensions, engineering data. *W. C. Dillon & Co., Inc.*, 5410 W. Harrison St., Chicago 44.

Gear Hobbing

Elementary discussion of hobbing process, special applications, effect and control of proper sharpening featured in catalog which also includes line of company's machines illustrated by photo and specification drawings, lists of specifications and descriptions of features and application. *Barber-Colman Co.*, Machine & Small Tool Div., Rockford, Ill.

Hose, Flexible Metal

Catalog 100 gives recent developments in interlocking and seamless hose for diesel exhausts, or conveyors for liquids, gases, solids, and in heat and pressure problems; test tables and installation methods and applications added. W. D. Inmen, Sales Mgr., *Atlantic Metal Hose Co.*, 123 W. 64th St., New York 23.

Oils, Hydraulic

Revised edition of "Houghton Handbook on Hydraulic Oils" includes addition of chapter on flushing of hydraulic systems discussing various procedures used and recommending improved ones; deals also with hydraulic oil

BOOKLETS, CATALOGS CURRENTLY OFFERED BY MANUFACTURERS

specifications plus importance of additional properties and many other features. *E. F. Houghton & Co.*, 303 W. Lehigh Ave., Philadelphia 33.

Precision Steel

Ninety-eight page catalog reference for steel buyers and users includes AISI and SAE steel analyses, a glossary of trade terms, decimal equivalent tables, comparative tables on Rockwell and Brinell hardness and weight tables on both coil and cold rolled strip steel, in addition to specifications on all Precision brand steel products. *Precision Steel Warehouse, Inc.*, 4409-25 W. Kinzie St., Chicago 24.

Presses

Production advantages of their open-back inclinable presses and improvements on complete line stressed in illustrated catalog No. 2-C. One section devoted exclusively to component parts and accessories. *E. W. Bliss Co.*, Toledo.

Sheetmetal Work

Pocket-size booklet No. 200-G shows typical machines and tools in line of equipment for sheetmetal shops, each accompanied by description (including bulletin number giving full detail) and mathematics chart for quick answers to circle circumference and area questions. *Niagara Machine & Tool Works*, 637-697 Northland Ave., Buffalo 11.

Silicates

Twenty-paged pocket-size manual concisely describes 10 "standard" grades of Diamond liquid silicates of soda commercially available. Data, including physical properties, major industrial applications, basic advantages and size and net weights of packages, presented on each grade. *Diamond Alkali Co.*, 300 Union Commerce Bldg., Cleveland 14.

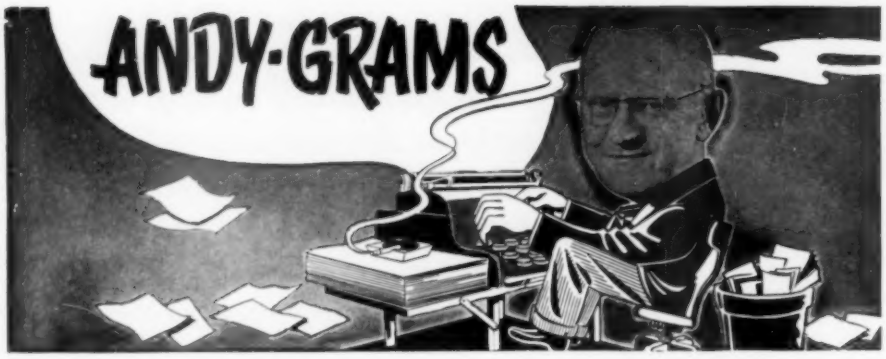
Steel, Zinc-Coated

"Fabricating and Finishing of Armco Zinc-grip-Paintgrip" divides information into sections on storage, forming and drawing; welding and soldering; and cleaning and painting; also describes material and the paint-holding tests conducted by National Bureau of Standards and Bell Telephone Co. laboratories. *Armco Steel Corp.*, 1049 Curtis St., Middletown, Ohio.

Surface Grinders

Rotary type surface grinder, No. 24, subject of bulletin No. 144-2RM which presents detailed description of machine and its capabilities as well as specifications and examples of work run. *Mattison Machine Works*, Rockford, Ill.

ANDY-GRAMS



Well, the *longtemps* contemplated Big Move has been made and the staff is now at Society HQ and getting back in the groove. Me, I'm safely confined in a padded cell of my own at the far end from the whosit but the pencil sharpener's right handy. Visitors welcome, apropos which first in line was Fred Lindblad of Aurora, Ill., come with greetings from the Fox River Valley boys. While in town, he took in the Art Exhibition I told you about in December and which was really big time. You should have been there!

Having to attend the Preview in Chicago, a few Saturdays ago, I stopped at the Ambassador West where juveniles and adult infants as well congregate to mob celebrities for autographs and such. If you ain't a V.I.P. they say: "Oh h--l, just another punk!" Took me for a new movie star—maybe another Boris Karloff—but I said I was *Incog* which impressed 'em plenty. Nothing like a bit o' mystery, y'know.

While there, went into a hardware store—Ruhling's, on No. Clark St.—to get me a bastard file a/c having some delicate dental work in mind. There, I ran across a *plättjärn*, which is a special kind of griddle for frying those little Swedish pancakes that go so well with *krösemos*—well, lingonberry preserve in Yank. I'm passing the infor along for benefit of Mmes. Grant Wilcox and Clyde Mooney who, among others, have developed a yen for *smörgasbord*. Even cooking takes tools besides which tooling goes the better for good eats.

Coming back to the li'l talk with Len Singer about quicker obsolescence of machine tools, and further apropos speeches at the Semi-Annual anent buying more goods from Canada, I can readily see where both the machine tool builders and industry as a whole can benefit from periodic modernization. While it would be dubitable economy to scrap a late model machine tool just because someone wants to sell a later model, certainly manufacturing economy warrants the latest and best in a highly competitive age.

As far as reciprocal trade is concerned, we can never effect a balanced world economy until trade barriers are so evened that nations can trade equitably with one another. At our rate of mass production we will eventually reach the saturation point as far as the domestic market is concerned, and then we'll be in a bad way unless we can find outlets through foreign markets. And if foreign producers can't sell to us, or to other buyers, then they'll be in a bad way and then we'll have a resurgence of the struggle for survival which is largely responsible for wars. You just can't balance world economy by extremes of "haves" and "have-nots".

Most people have something to make and sell that others don't make but want regardless. Thus, the English make good chinaware among other things, the Japs and Germans—and they're no longer our enemies—make cheap toys that boom the dime store trade, and so it goes from quality products through to luxury items. Everybody wants his place in the sun and what we need more than anything else to make the dream of "one world" come true is more of a spirit of live and let live.

One thing for which I have consistently contended is a broader understanding of the people with whom we share our world. While it is entirely true that, in remote places, there are aborigines and primitives who still live in the stone age, we are nevertheless inclined to underrate many peoples and to judge their standards of life and education in terms of a half century or more ago. Yet, it were impossible for the Negroes of Africa or Asiatics in Indonesia to agitate for independence and self government unless literate and educated leaders could appeal to reasoning if not altogether literate compatriots, or who could further present logical arguments before such a body as the United Nations.

In this connection, I quote (from a newspaper) a comment by Carlos F. Romulo, president of the U.N. General Ass'y, who recently voiced a plea for broader human understanding: "I am a funny looking man . . . a Filipino, a foreigner. Perhaps all you know (of Filipinos) . . . is people photographed wearing G-strings.

"But see! I crack jokes, I wear clothes, I am a human being. Foreigners are human beings endowed with the dignity of the human soul. When you learn that and apply it, you will be contributing more to international peace than any diplomatic treaties." Only a scholar could have said that.

From one thing to another, I see where the magazine Time ran quite an article about Charles Lindbergh who, it seems, remains content to live his life without fanfare of publicity. Few men have done so much to advance the cause of science, and especially the science of aviation, yet few men have been so maligned or have so had their statements distorted. Yet, he took it in silence and left it to the passing years to effect vindication.

Persona non grata to the wartime administration, he was refused entry into the Service and, despite unquestioned qualifications, was even blacklisted as consultant for two of the major aviation companies. But when Henry Ford started to build bombers at Willow Run that independent master of mass production turned a deaf ear to Washington and took the Lone Eagle on regardless. And he got things done!

During the war, civilian Lindbergh shot down Zeros along with the commissioned flyers and rather surprised the youngsters who thought that a man would be in his flying dotage if past 30. Well, you can't hold a good man down, especially if he is true to himself and holds to convictions that will stand the acid test of time. "They say, let them say it."

At moment of writing, I am saddened and shocked beyond expression at the tragic passing of Ruth Bramson, wife of Roy T. Bramson who, for many years, was publisher of The Tool Engineer. While visiting in a Birmingham, Mich., antique shop, the building exploded as a result of gas leakage, killing five and injuring several.

I believe that I speak for thousands of friends, among ASTE-ers who had come to know and respect both Roy and his loyal wife, in extending the most heartfelt sympathies both to Roy and son Tommy in their bereavement. Yet how proud they both can be in the memory of a wonderful wife and a wonderful mother! Gentlemen, turn down an empty glass.

I also hear that Joe Siegel, first ASTE Prex, is currently under the weather and taking things easy pending recovery. A kindly man and a clean liver, Joe has nevertheless subscribed to one fault common to so many ASTEers who have unselfishly devoted their lives to the betterment of humanity—he's been burning the candle both ends to the middle. But there again, ". . . he who gives his life shall have it", not necessarily in the passing from a mundane existence but in the rewards of satisfaction that accrue from a work well done. Okay, Joe, get on your feet but not too fast, and then do what they've been telling me—*slow down!* But omigosh, there's so much to be done!

And now, a parting word: Let's all get to know and understand one another the better.

ASTEely yours

Andy

Production UP...Costs DOWN with Special Tooling by POTTER & JOHNSTON

Three **SEPARATE PRECISION JOBS**

One **P&J — ENGINEERED SET OF SPECIAL TOOLS**

One **P&J AUTOMATIC**

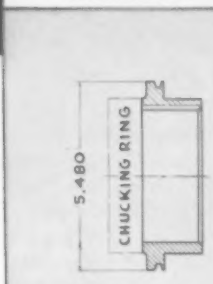
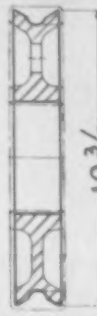
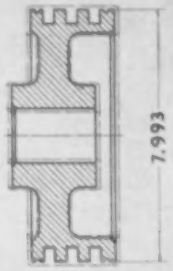
Experience does it every time. With it, you get the best in production-tooling, the best in precision, finish, speed, economy. Cases in point are these three dissimilar jobs, varying widely in size and specifications:

1. A semi-steel Retainer casting
2. A steel forged Sheave
3. A cast iron Piston

All three of these pieces are machined to the limits and class of finish specified, *on ONE machine — the 5 DE Automatic — with ONE combination set of tools designed by the ingenuity of P&J specialists backed by fifty years' experience in this special kind of tool engineering.*

Perhaps *your* varied parts production can be put on a similarly profitable basis. It pays to check with P&J – you stand to gain in production, in fewer rejects, in economy, in divided labor costs. Simply send your parts or prints to P&J for tooling recommendations and estimates.

3 SEPARATE JOBS

RETAINER	SHEAVE	PISTON
		

3 SEPARATE OPERATIONS

RETAINER	SHEAVE	PISTON
Rough turn hole Rough turn dia. Rough turn O. D. Face flange Face end Finish-machine above 5 operations Machine groove in O.D. Chamfer hole Size bore hole Cut off chucking ring (Note overhead Cut-off Attachment)	Rough bore hole Rough turn O.D. Straddle face at rim Groove in O.D. Straddle face hub Finish bore hole Form 30° angle in groove Ream hole	Bore under rim Turn hub; face bottom Turn O.D. Rough bore hub Face, chamfer at rim Finish face hub Core drill hole Rough turn O.D. Face rim; turn hub Machine O.D. grooves Face hub; form web Finish face hub Finish turn O.D. Finish bore hole Chamfer; ream hole

MACHINED ON *One* P&J AUTOMATIC
P&J-TOOLED FOR ALL *Three* JOBS

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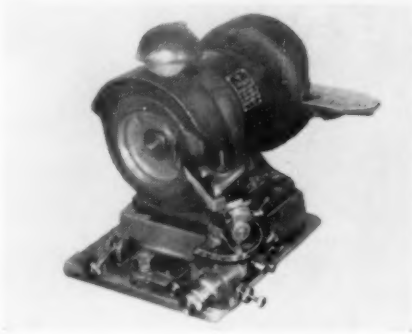
P&J AUTOMATICS...
...ed for Production - Speed - Economy
...roduction Tooling Headquarters

Adapter Base for Bench Grinder

An Adapter Base designed to convert a bench grinder into an accurate carbide grinding machine has been developed by E. F. Hager and Son, Queens Village 9, N. Y. The attachment makes available the "reciprocating action" Tool Holder used in the larger Hager Universal Carbide Grinder, and is said to permit accurate grinding of carbide tools with only a modest investment in additional equipment.



The reciprocating action produces a straight and smooth cutting edge, with prolonged wheel life, the continuing motion tending to prevent overheating of the carbide during grinding—a common cause of carbide failure. All front, side and top angles can be properly set in both vertical and horizontal planes, and firmly locked in position to permit trouble-free grinding.

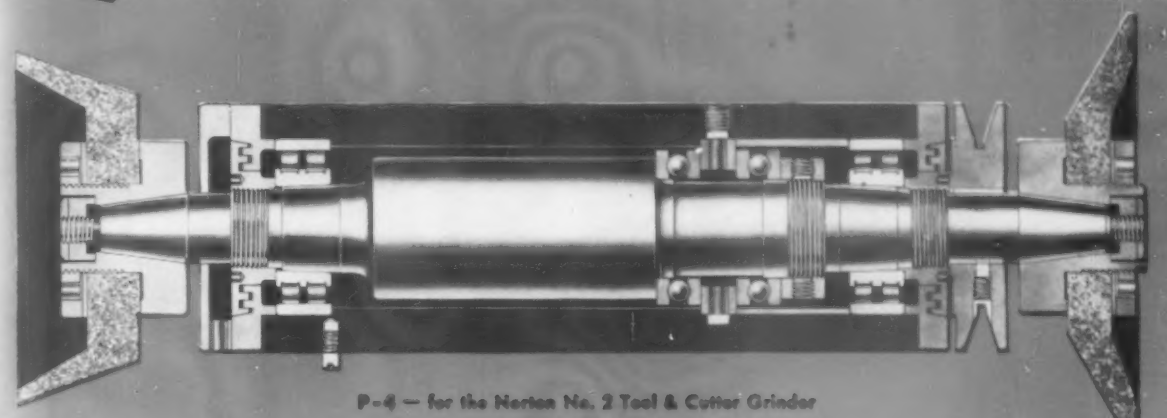
The feed of the tool towards the grinding wheel is accurately controlled by the feed knobs, which are graduated in 1/1000 in. divisions. The tool holder, which holds single point cutting tools up to 1¼ in. high, is mounted on a sturdy arm which swivels from one side of the wheel to the other, to permit grinding of both right and left hand tools. **T-1-36**

Magnetic Perforating Dies

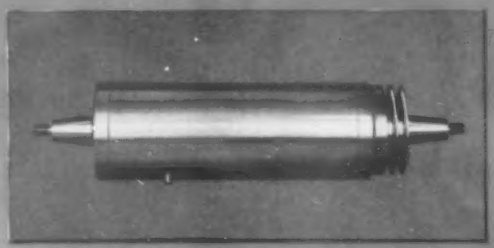
Announced by S. B. Whistler and Sons, 748-756 Military Rd., Buffalo 17, N. Y., is their Magnetic Perforating Dies which will have their first public showing at the ASTE Show in Philadelphia. It is planned to have two presses in actual operation during the entire Show, April 10 through 14. Those unable to attend the Tool Engineers Convention can write the manufacturer for illustrated literature covering this development. **T-1-37**

Look at these

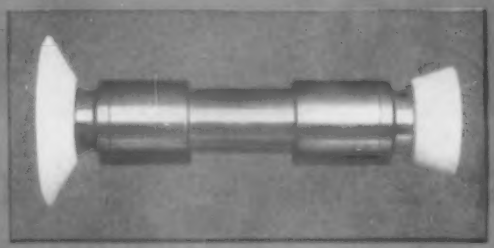
New POPE Tool and Cutter Grinder SPINDLES



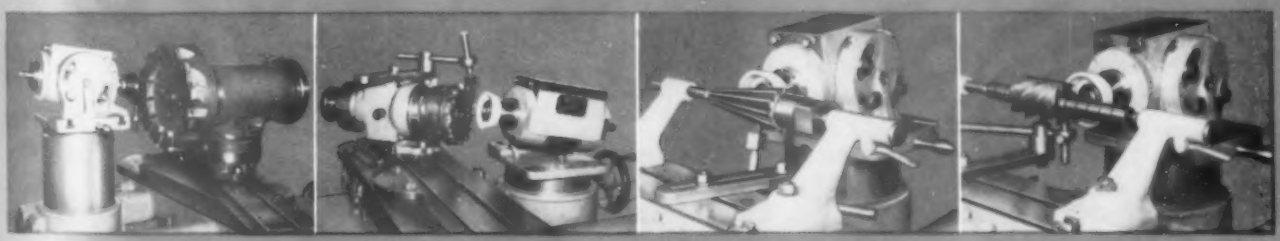
P-4 — for the Norton No. 2 Tool & Cutter Grinder



P-11 — for Norton No. 1 Tool & Cutter Grinder, available with a single or double V-grooved pulley



P-274 — for the Cincinnati No. 2 Cutter and Tool Grinder



P-6651 — an advanced design 1 HP Motorized Spindle for No. 2 Cincinnati Cutter and Tool Grinder mounted in a bracket which provides a new and useful adjustment in a vertical plane

Look again at top picture showing super-precision roller and thrust bearings, applied to give you the radial and axial rigidity you've always wanted. Endwise movement of the shaft in either direction eliminated.

No. 65

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BUILDERS OF PRECISION SPINDLES

for HIGH PRODUCTION BROACHING see *American*

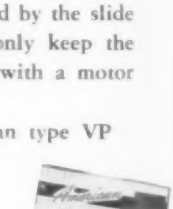
Transmission Maker produces over 600 internally splined hubs every hour with AMERICAN Automatic Broaching Machine.

Full automatic operation which keeps pace with automotive mass production schedules is economical and practical with American engineered broaching machines. Take, for example, the problem of this transmission manufacturer. The part was a steel forged hub blank, which required broaching of an internal diameter and six splines. The production rate specified was high.

American engineers recommended a VP-4-25-36 vertical internal pull up broaching machine arranged with four (4) broaching stations, manually loaded feed unit with hydraulically operated work slide for traversing the parts from the magazine to broaching position.

The slide carries four parts from the loaded magazines to broaching position and lower cylinder automatically starts on up stroke. Broaches are carried through the part to the pull heads, and the first broaching teeth carry up the part and locate it against the work bushings as the broaching stroke starts automatically. At the end of the stroke the parts drop and are automatically deflected to the front of machine, the broaches return to the lower position, and four new blanks are positioned by the slide for the next stroke. The operator need only keep the magazines loaded. The unit was supplied with a motor driven chip conveyor.

Perhaps a semi or fully automatic American type VP broaching machine is the answer to your production problems. They are built in several sizes and tonnages to suit a wide range of internal broaching operations. For more complete information write for new Circular 400. Address Dept. T.



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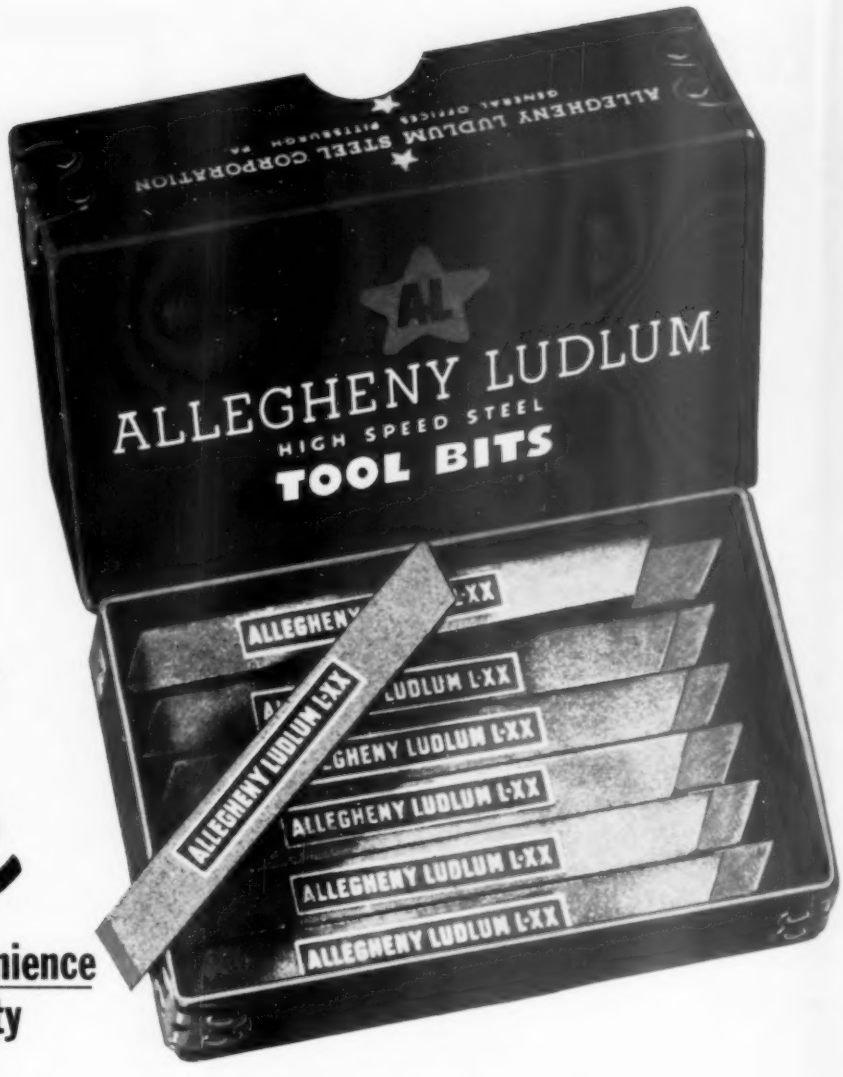
—these bits give you convenience economy, dependability



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Just send a postal-card request—giving name, position, company, and address. Ask for "A-L Tool Bit Price List," pocket edition. While you're writing, also include the illustrated four-page folder, "A-L Mill Treated High Speed Steel Tool Holder Bits." Yours for the asking.

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These better tool bits, packed in the famous blue-and-gold boxes, are immediately available in standard sizes from stocks located at 28 convenient points throughout the country.

Ready Made—this means that bits are: (1) already cut to correct lengths, with clearance bevel at both ends; (2) already heat treated uniformly by mill experts; (3) furnished with either regular finish or ground finish; (4) inspected individually for hardness, size, and surface. "Finish-ground" bits are extremely accurate in dimension, entirely free from decarburization and scale, and ready for instant use upon grinding the cutting point to desired shape.

With six popular grades to choose from, you can cover a wide range of cutting needs by specifying these tool bits. Our informational service will be useful to you in selecting grades. Call A-L, or an A-L distributor.

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STEEL CORPORATION
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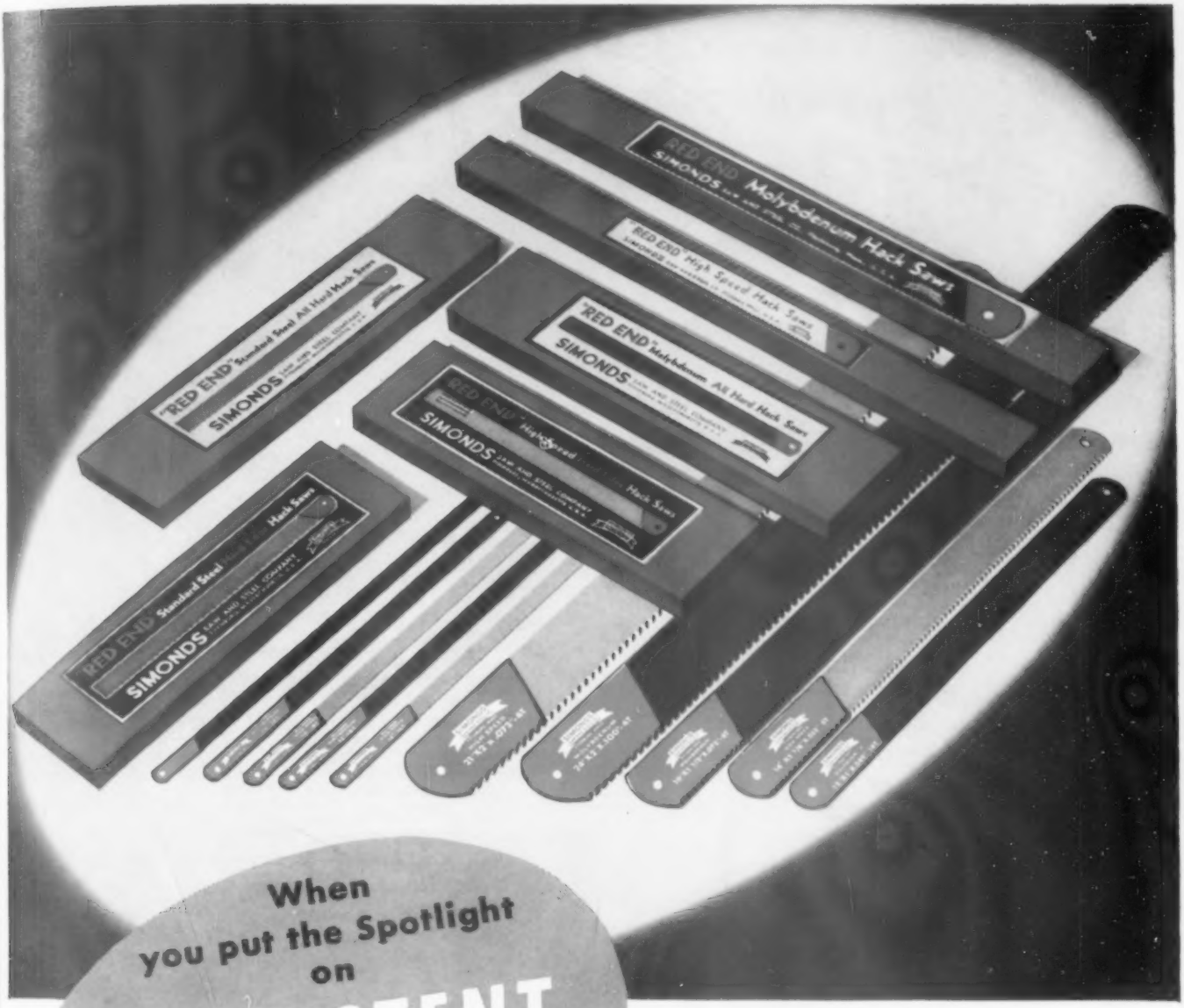

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In Hacksaws

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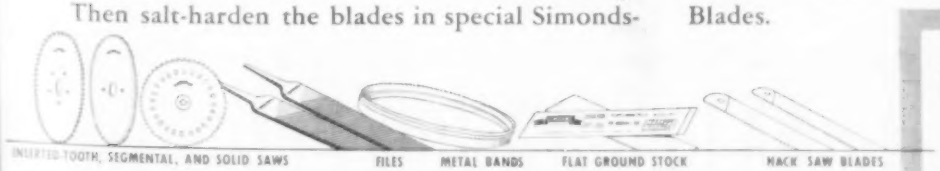
Take a special Simonds steel . . . formulated, poured, and spectrometer-checked in Simonds modern electric mills. Cross-roll that steel 90° for uniform quality. Mill the teeth ... and set them automatically. Then salt-harden the blades in special Simonds-designed furnaces. *And what have you got?* Exactly what you would expect to have . . . the finest blades made for hand frames or power machines ...Simonds "Red End" Hacksaw Blades.



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Engineering News
ON ABRASIVE PRODUCTS

Belt Backstand Idler Techniques Effect Operating Cost Reduction

Substantially increased output, lower unit costs and improved finishes are influencing more metal working plants to switch to belt backstand idlers for grinding and finishing flat and contoured surfaces of both small and medium weight pieces. In many factories where set-up wheels were formerly used, conversion from 25 to 100% to the backstand technique has been effected. While these methods normally involve grinding speeds of 6500 to 7000 SFPM with glue-bonded abrasive cloth belts, speeds of 10,000 SFPM are being used widely today with resin bonded belts.

As a result of recent wide-spread experiences with belt backstand idler techniques, our trained staff of engineers is equipped to guide users in making the best use of this equipment. In all cases they are able to recommend applications and abrasive materials to meet your requirements.

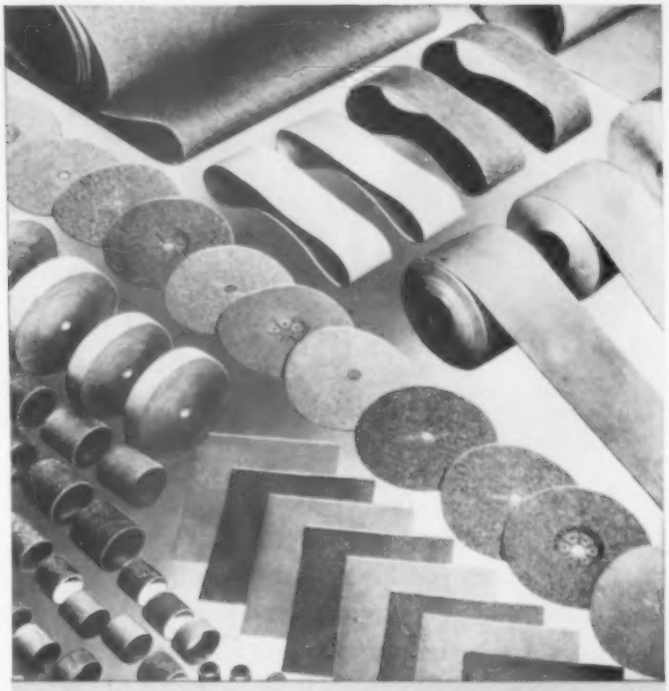
Better Work with Cylindrical and Crankshaft Grinding

Cylindrical grinding wheels including crankshaft wheels by CARBORUNDUM are engineered to provide the tools required for maintenance of efficient production rates, rapid stock removal and fine surface finish.

V11 bond represents the most recent contribution to this class of grinding. These wheels are designed with a *specific structural balance* which when combined with the proper grain size and abrasive type offers the following advantages to both operator and management:

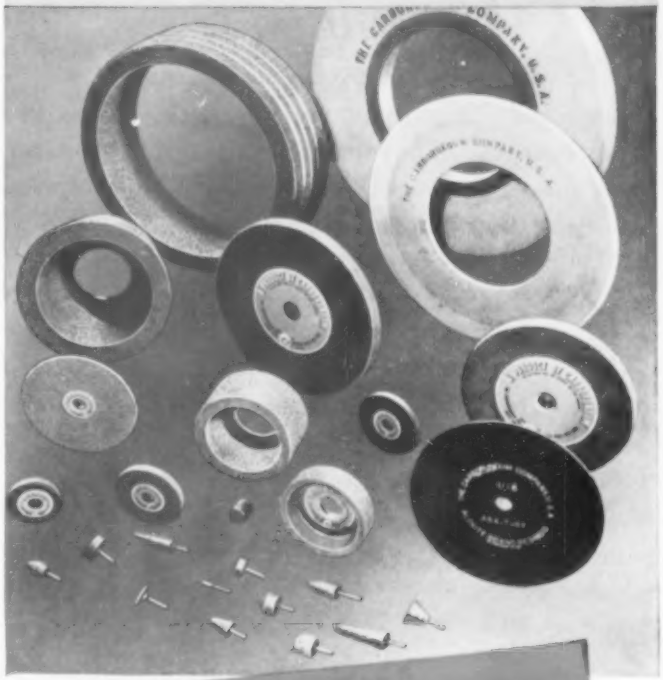
1. Cool and free cutting characteristics promote more efficient production of superior finishes and close tolerances. This is of great importance in operations involving both OD and shoulder or face grinding.
2. Designed structural balance permits continuous fast cutting rates which promote high production.
3. Fast cutting qualities combined with long life save dollars in operator and machine time as well as abrasive costs.
4. Engineered uniformity of the abrasive and bond components of these wheels permits close control of part size and form.
5. Self dressing characteristics provide longer periods of use between dressings... save dressing time, usable abrasive and dressing tools.
6. Ability to grind a wide range of materials makes possible savings in inventories of special wheels and minimizes requirements for premium priced abrasives.
7. Savings in set-up time are made possible because the versatility of V11 bond wheels permits efficient grinding of many varieties of work, making it unnecessary to change wheels when changing from one job to another.

For prompt attention to abrasive problems, call your nearest branch office of The Carborundum Company.



COATED PRODUCTS — SHEETS • ROLLS • BELTS • DISCS SPECIAL SHAPES

BONDED PRODUCTS — ABRASIVE WHEELS • STICKS, STONES AND RUBS • SPECIALTIES • SUPERFINISHING STONES • SPECIAL FORMS • ABRASIVE GRAINS AND FINISHING COMPOUNDS



FOR EVERY ABRASIVE APPLICATION
...CALL IN
CARBORUNDUM
TRADE MARK

WHY YOU CAN CUT COSTS WITH THESE NEW SUNDSTRAND AUTOMATIC LATHES

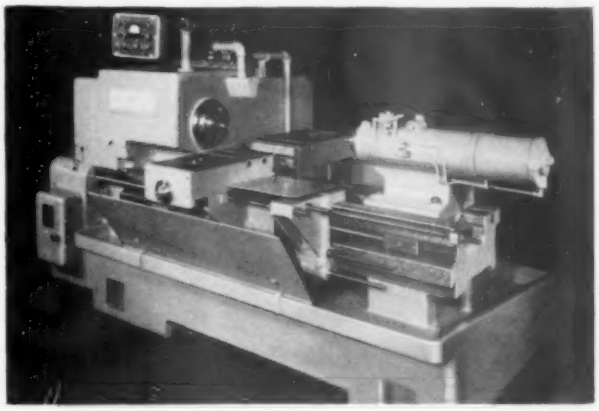
Model 4 Automatic Lathe, the smallest of Sundstrand Automatic Lathes, is ideal for turning a wide variety of small parts. Maximum swing is 9½" diameter.

The over 7,700 users of Sundstrand Lathes have always found them a profitable investment. Many have changed from old to new Sundstrands and received the benefits of the higher productivity resulting from design improvements. The following features incorporated in the design of the latest models of Sundstrand Automatic Lathes will help you cut costs further. Call in a Sundstrand engineer to assist you in selecting the proper method and machine for your work. There is no obligation for this service.

Sundstrand Model 8A takes up to 25 HP spindle drive motor. Maximum swing is 12½" diameter.

Greater Horse Power

All new Sundstrand Automatic Lathes have been redesigned for greater rigidity and larger spindle drive motors. They have ample power for use of carbide cutting tools and are capable of doing more work. Note the massive headstock design in the machines illustrated.



Sundstrand Model 12A, a new automatic lathe for handling work within a 15¼" diameter swing. Can be furnished with longer beds.

Wider Feed Range

A wider feed range has been provided to enable the handling of a greater range of parts and materials at maximum cutting efficiency. The new Models 4, 8A and 12A have a ratio of 18 to 1 between high and low feeds — Model 16 has an even greater range.

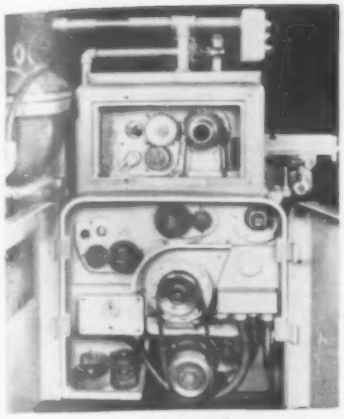
Greater Carriage Adjustment

Both front and rear carriage of the latest Sundstrand Automatic Lathes are adjustable full length between headstock and tailstock centers — another important new feature.

Sundstrand Model 16 Automatic Lathe has large swing (17" swing over slides) and a 75 HP motor for heavy cuts and carbide cutting tools.

SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS U.S.A.

RIGIDMILS • FLUID SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT



Faster Set-Up

The photo at the left is an end view of machine showing convenient location of pick-off gears for changing spindle speeds and front and rear carriage feeds. The feed and speed chart and pick-off gear storage compartment are all readily accessible for quick set-up or changeover.

Quick Cycle Change-Over

Complete control of all cycles is provided by adjustment of dogs on a disk. Making cams is eliminated. Changing position of dogs on disk changes length of rapid approach, feed and rapid return strokes — enables operator to set up cycle quickly and changeover from one job to another easily.

Wider Speed Range

Spindle speed range ratios have been increased to 30 to 1 on all new Model Sundstrand Automatic Lathes to obtain maximum in cutting efficiency over a wider range of sizes of parts and material. The spindle unit is equipped with two driving gear centers, which increase the range between high and low spindle speeds. In addition, four speed changes can be obtained from one set of gears instead of the usual two.

Automatic Lubrication

To insure long machine life and lower maintenance costs, all moving parts within the machine, such as spindle bearings, gears, carriage and cross slide ways, are provided with automatic lubrication.

Automatic De-Clutching

All new Sundstrand models have been provided with automatic declutching between spindle and spindle motor with self-adjusting magnetic clutch and brake for quick stopping of spindle rotation.

Screw Feed to Front Carriage

All new Sundstrand Automatic Lathes have screw instead of rack feed to the front carriage — resulting in fine finish and long tool life.

Hardened and Ground Carriage Ways

All new Model Sundstrand Automatic Lathes have hardened and ground carriage and cross slide ways.

4 Models Cover H.P. Range of 3 to 75 H.P.

	MODEL 4	MODEL 8A	MODEL 12A	MODEL 16
SPINDLE MOTOR	3 to 7½ HP	10 to 25 HP	20 to 50 HP	50 to 75 HP
SPEED RANGE Type A	30 to 1800 RPM	40 to 1200 RPM	30 to 900 RPM	15 to 750 RPM
SPEED RANGE Type B	60 to 3600 RPM	80 to 2400 RPM	60 to 1800 RPM	
FEED RANGE	.0015 to .054 IPR	.00096 to .289 IPR	.00096 to .289 IPR	.0025 to .100 IPR
FRONT CARRIAGE:				
Longitudinal feed, max.	6"	8"	10"	12"
Swing over cross slide, max.	9½"	12½"	15¼"	17"
Rapid traverse rate	300"	250"	250"	250"
REAR SLIDE:				
Max. stroke	4"	5½"	6½"	8"
LENGTHS BETWEEN CENTERS	15, 24 & 36"	24, 36 & 48"	24, 36, 48 & 60"	36, 60 & 84"

FREE *Additional Data*

The complete new line of Sundstrand Automatic Lathes includes the Models 4, 8A, 12A and 16 and they range from 5 to 75 HP. Write for complete information on these new machines today. Ask for Bulletins 791.

SUNDSTRAND MACHINE TOOL COMPANY

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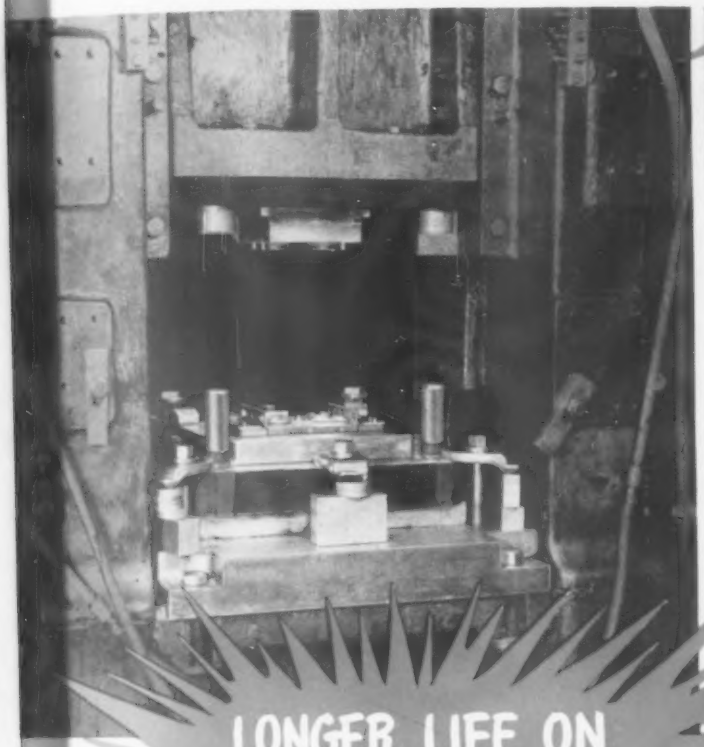
DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES

DANLY DIE SETS

LESS TIME IN THE DIE SHOP

Die assembly work is easier and more accurate when it's based on reliable Danly precision.



LONGER LIFE ON THE PRODUCTION LINE

Hardened, ground and lapped leader pins and precise bushing fits assure accurate die relationship and more parts per grind.

Danly Die Sets will assure the performance of your dies... and they mean greater convenience too! Large or small, standard or special, there's a Danly Die Set quickly available to meet your specific tooling requirements.

All standard Danly Die Sets are "on hand" in a nationwide system of assembly branches for prompt delivery from stock!

WRITE FOR THIS FREE BULLETIN

. . . and see how Danly's special die set machining service will mean important savings in your tool shop.

Which DANLY branch is closest to you?,

- Chicago 50, 2100 South 52nd Avenue
- Cleveland 14, 1550 East 33rd Street
- Dayton 2, 990 East Monument Avenue
- Detroit 16, 1549 Temple Avenue
- Grand Rapids, 113 Michigan Street, N.W.
- Long Island City 1, 47-28 37th Street
- Los Angeles 54, Ducommun Metals & Supply Co., 4890 South Alameda
- Milwaukee 2, 111 East Wisconsin Avenue
- Philadelphia 44, 18 West Chelten Avenue
- ☆ Rochester 4, 16 Commercial Street

☆ *Indicates complete stock*

DANLY

MACHINE SPECIALTIES, Inc. 2100 South 52nd Avenue, Chicago 50, Illinois

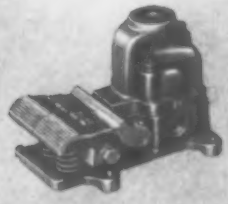
OVER 25 YEARS OF DEPENDABLE SERVICE TO THE STAMPING INDUSTRY

PRECISION MADE for LASTING SERVICE...

Hanna Valves

for every control problem

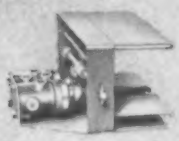
UNITITE—3-Way or 4-Way Valves . . . quick-acting, packless . . . for pressures to 250 psi. . . . in three mounting styles



FOOT OPERATED—Either single or double pedal . . . for pressures to 250 psi. . . . provides quick, effortless control.

⅛" UNITITE JR.—For light piping and tubing . . . control air, oil or water pressures up to 300 psi.

PILOT VALVES—3-Way . . . for direct control of small cylinders, automatic control of large cylinders as pilot for "Mastair."



FOOT PILOT VALVES — 4-Way . . . for hand-free control of small cylinders, automatic control of large cylinders—through "Mastair" Valve.

"MASTAIR"—Balanced spool type . . . controlled by one 4-Way or two 3-Way pilot valves.

SOLENOID—New 4-Way Valve . . . small, compact, low current consumption.

SPEED CONTROL—Regulates inflow and outflow of either air or oil independently to and from one side of piston.

SEND FOR

New Valve Catalog 251

Gives full information on the Hanna Valve line.

You can be assured of long, trouble-free service with valves designed and made by Hanna—for Hanna Valves have a reputation throughout industry for excellent performance over the years.

In the equipment you design and build . . . in the equipment you use . . . specify Hanna Valves and be sure of the best. There is a Hanna Valve for every control problem.

Hanna Engineering Works

HYDRAULIC AND PNEUMATIC EQUIPMENT . . . CYLINDERS . . . VALVES . . . RIVETERS

1765 Elston Avenue, Chicago 22, Illinois

NEW LIVE CENTER

FOR LATHES AND OTHER MACHINES

CARRIES HEAVY LOADS AT HIGH SPEEDS

by S-J SCULLY-JONES

You get accurate, safe, low-cost turning operations with the new Scully-Jones Live Center. It is simple in design... thoroughly tested... and proven in actual shop use.

(A) CARRY HEAVY LOADS AT HIGH SPEEDS ACCURATELY—SAFELY

This new Live Center safely carries heavy loads at the high speeds required when using carbide-tipped tools. Two matched standard precision Timken tapered roller bearings, aligned for accuracy and anti-friction rotation, provide large bearing surface to take shock loads and abuse. Safely operates at high speeds. Load carrying capacity, 1000 lbs. for the No. 2 and 3 Morse taper sizes, 2400 lbs. for the No. 4 and 5 Morse taper sizes (Rating at 100 RPM).

(B) GET RIGID SET-UP THROUGH QUICK ADJUSTMENT

Threaded retainer ring preloads bearings and provides adjustment for wear—assures a rigid set-up. Bearings are preloaded at factory.

(C) PERFORM ACCURATE WORK—ELIMINATE REJECTS

Spindle is of alloy steel hardened to 64 Rockwell "C". Point ground in own bearings, after assembly, to guarantee holding runout within .0002" total indicator reading. Has threaded hole for fast redressing of point.

Shank is induction-hardened for strength and resistance to wear; precision ground for a perfect fit.

(D) GET LONG LIFE—LOW MAINTENANCE

Heavy-duty grease seal is incorporated in threaded retainer ring. Rotating neoprene ring seals assembly against entrance of grit and chips.

(E) SAVE TIME GREASING—REDRESSING

Grease port, with ⅛" pipe thread in rear of shank, for standard grease fitting. Through this port a threaded rod is inserted to rotate spindle when redressing point with a tool post grinder.

STOCK DELIVERY ON NOS. 2, 3, 4 and 5 MORSE TAPER SIZES

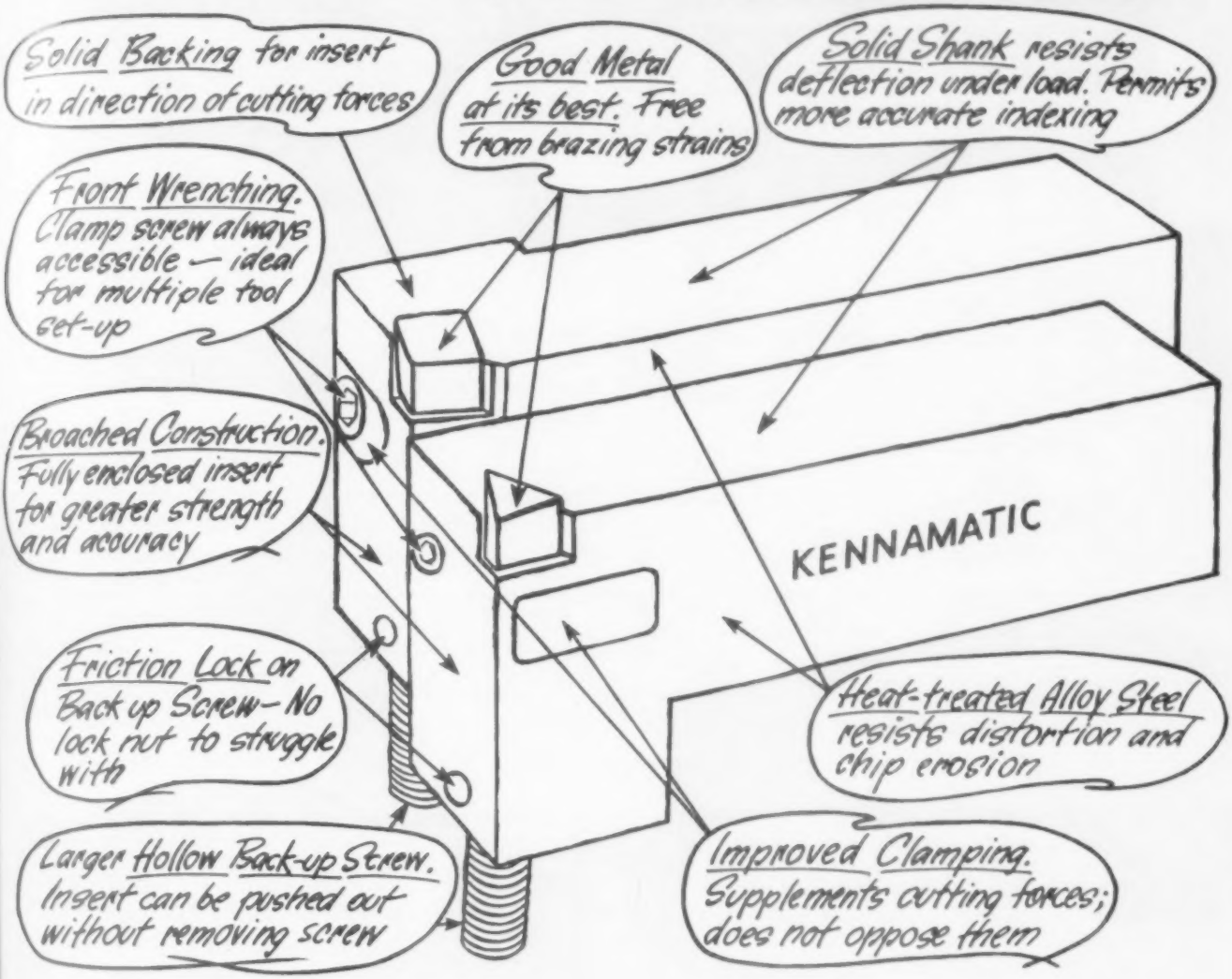
SEND for Bulletin containing Prices and Specifications

Scully-Jones AND COMPANY

1915 S. ROCKWELL ST., CHICAGO 8, ILLINOIS

YOU GET LOW COST, FAST, ACCURATE PRODUCTION WITH OUR STANDARD AND SPECIAL TOOLS

Notes on the improved KENNAMATICS



Kennamatic Tools have saved thousands of dollars for industry after industry because: Solid, mechanically-held, indexable insert—positioned vertically makes best use of Kennametal's great compressive strength and assures extended tool life; simplified tool setting—indexable insert has several cutting edges on both ends and therefore can be revolved on its axis, turned end over end, or replaced, without changing setting of tool holder; less grinding expense —resharpening merely requires squaring off end of insert and grinding chip breaker, if desired.

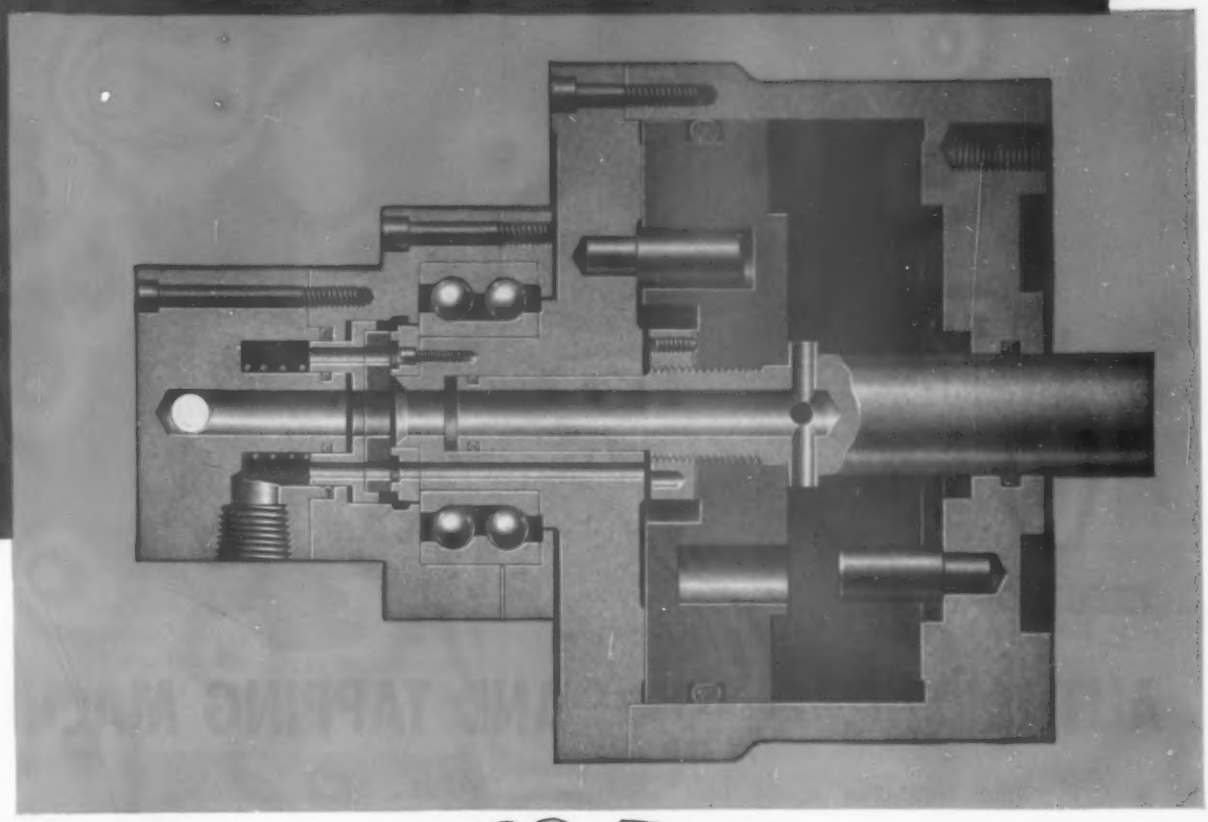
Now, a *new, improved* Kennamatic Tool Holder has been developed. This still utilizes the well-known distinctive properties of the standard Kennametal insert, and incorporates the other advantages that have proved so successful in the previous design, *plus* the novel structural features noted in the sketch. *You secure these improvements without additional cost.*

Write for Supplement 1 to Catalog 49

KENNAMETAL Inc.
LATROBE, PA.

STYLE RAR Opposite hand Style RAL | **STYLE TAR** Opposite hand Style TAL | **STYLE SBR** Opposite hand Style SBL | **STYLE TFR** Opposite hand Style TFL | **STYLE TBR** Opposite hand Style TBL

AN IMPORTANT ADVANCE TO MEET TODAY'S DEMAND FOR SPEED IN MACHINING



THE CUSHMAN HIGH SPEED *Aluminum* AIR CYLINDERS

FOR POWER CHUCK OPERATION

Especially developed for advanced machine tool applications . . . guaranteed to operate without pressure loss under heaviest recommended loads and at speeds to 6,000 r.p.m.

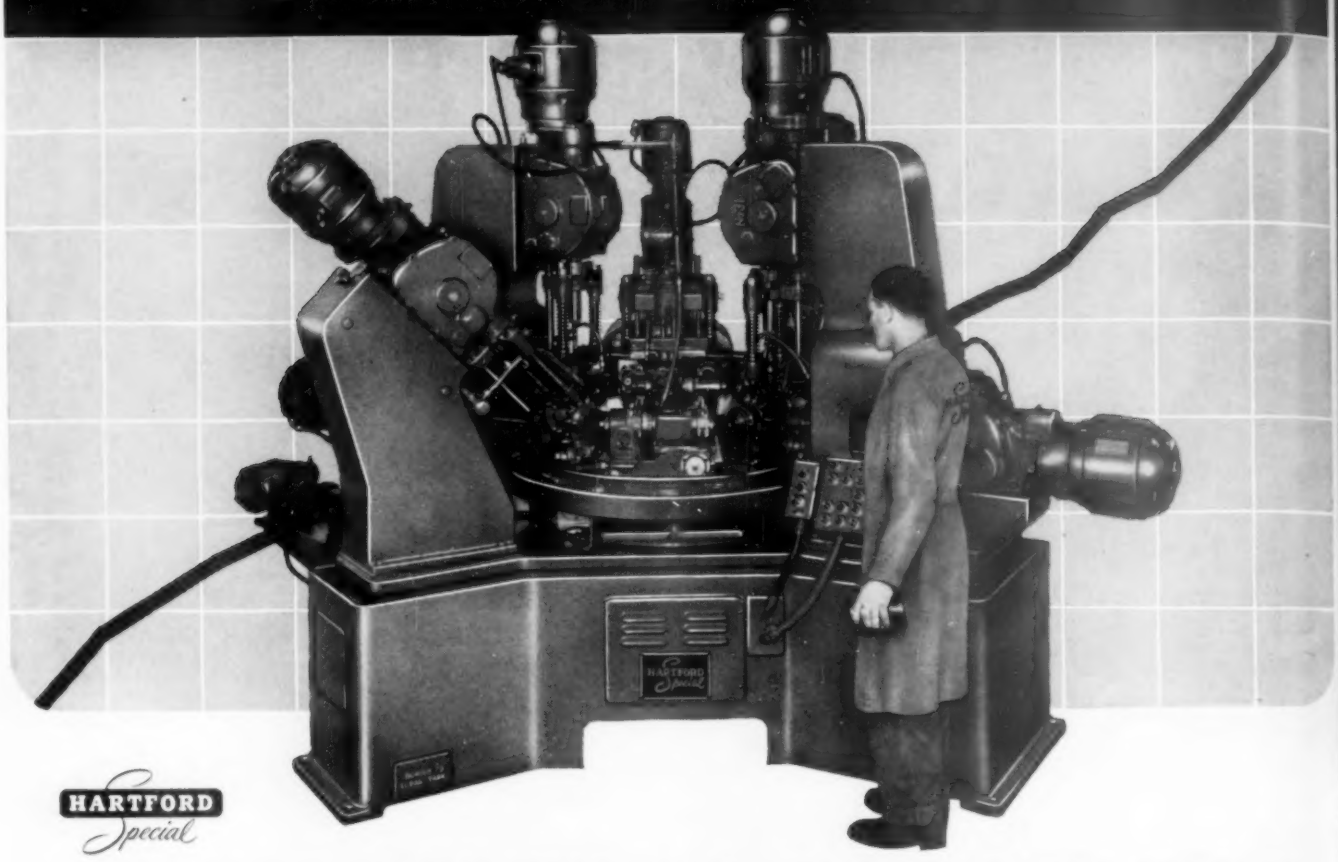
Aluminum alloy forged cylinder bodies finished with lapped bores . . . cylinders statically balanced after assembly, no vibration, low flywheel effect.

Available for use with Cushman or other chucks in 3¼" to 12" sizes. Send for Bulletin.

CUSHMAN also manufactures a complete series of WRENCH OPERATED CHUCKS
Write for Catalog 64 and Bulletins

THE CUSHMAN CHUCK COMPANY, HARTFORD 2, CONN.

rapid-fire production



HARTFORD Special

AUTOMATIC DRILLING AND TAPPING MACHINES

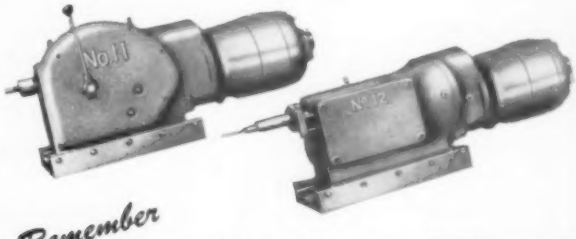
This machine combines speed and precision. Pieces are held to a close tolerance, yet finished at the rate of 9 seconds each. This six station machine drills and countersinks 4 holes, drills and spotfaces one, and drills and taps 4 holes, using only nine units. Fixtures holding the pieces revolve and are automatically indexed. Electrically interlocked system provides for individual or group operation. Sensitive control arranged with jogging feature allows units to be cycled individually and simplifies setting up and spot checking. Foolproof loading arrangement with automatic knockoff, special chip disposal system, and many other features are incorporated into the design.

with "Packaged Engineering"

If you're looking for economy and production in a single purpose machine, investigate the advantages of "Packaged Engineering" that make Hartford Special Drilling and Tapping Machines your best buy in the long run. Write our Engineering department now. The Hartford Special Machinery Company, Hartford 5, Connecticut.

HARTFORD Special

...the standard for special machinery



Remember

For special applications, Drilling and Tapping Units with or without attachable heads are available individually.

BTR

The versatile, safe-hardening tool steel

Long-wearing qualities and easy machinability are important considerations in this accurate locating gage made from BTR for an engine mounting yoke. Made by Lacey Manufacturing Co., Bridgeport, Conn.

This BTR forming die gives dependable service in the production of front wheel housings at the Metropolitan Body Company, Bridgeport, Conn. BTR is safe-hardening, holds accurate size.

1. **Safe** — *Oil-hardens at 1475 F*
2. **Accurate** — *Holds close dimensions in hardening*
3. **Long-Wearing** — *Good wear-resistance for long runs*
4. **Tough** — *Excellent shock-resisting properties*
5. **Easy-Machining** — *Anneals to less than 202 Brinell*

BTR is popular because it combines so many desirable qualities. It's versatile. Veteran toolmakers like it because it performs well in such a wide range of tools and dies.

BTR reduces cracking hazards, for it hardens at 1475 F . . . it's easy to machine and heat-treat . . . it's tough, wear-resisting, deep-hardening . . . and it's a non-deforming steel you can depend on when extra accuracy is important.

Here's an economical grade that belongs in your toolroom. Use it as a general-purpose steel. You'll like the way it saves tooling time, reduces tool failure, prolongs production between grinds.

The nearest Bethlehem Tool Steel distributor or Bethlehem sales office can give you more complete details. Prompt deliveries from local stocks everywhere.

TYPICAL ANALYSIS:

C	Mn	W	Cr	V
0.90	1.20	0.50	0.50	0.20

HEAT-TREATMENT:

Anneal at 1450 F, furnace-cool, 202 Brinell
Harden at 1475 F, quench in oil
Temper from 325 to 400 F for a working hardness of 58 to 62, Rockwell C

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation

Export Distributor:
Bethlehem Steel Export Corporation

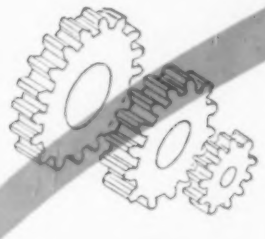
BETHLEHEM STEEL

SUPERSONIC TESTED

Bethlehem Tool Steel

Gear errors and Gear noise

should be discovered long before the gears reach final assembly . . .



There is a profit in scrap for the scrap dealer, but most certainly not for the gear manufacturer who suddenly discovers that an entire lot of gears have to be scrapped because they fail to meet tolerance requirements or because they are too noisy.

If economy is important in your plant, the time to find out about machining errors is right at the machine which causes the trouble—not after all the subsequent operations including heat treatment have been completed and the gears assembled in some power unit.

The best insurance against high cost of scrap gears is the use of gear checking machines right down there in the plant where the gears are being produced and where they can be checked periodically by the machine operators.

The Red Ring Gear Checker quickly reveals any dimensional errors and the Red Ring Gear Sound Tester immediately puts an accusing finger on noisy gears. Both machines have laboratory accuracy, they can be used anywhere in the plant or inspection department and they prevent a great deal of waste.

Get all the details by writing for Descriptive Bulletins.

SPUR AND HELICAL GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORM

NATIONAL BROACH AND MACHINE CO.
5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

The UNBRAKO Socket Head Cap Screw

...is specified by designers and production men everywhere because of its *time-saving* knurled head and its uniformly high quality.

Other "UNBRAKO" Products include: Socket Set Screws with Knurled Cup Points, Socket Set Screws with Knurled Threads, Square Head Set Screws with Knurled Cup Points—all patented Self-Locking screws that *won't shake loose!* Knurled Socket Head Stripper Bolts, Precision-Ground Dowel Pins, Fully-Formed Pressure Plugs.

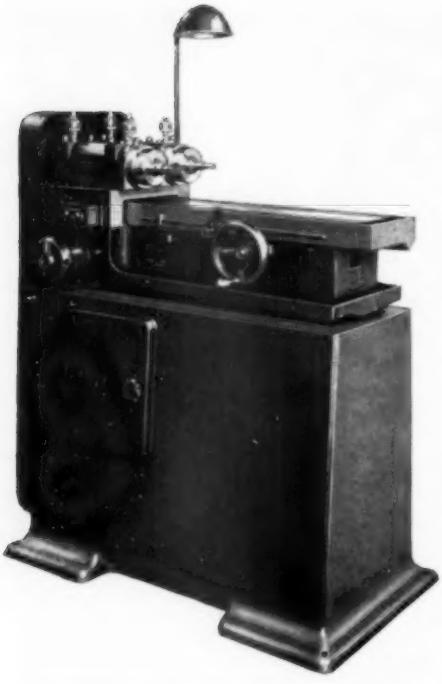
SOCKET UNBRAKO SCREWS

SPS STANDARD PRESSED STEEL CO.

BOX 786, JENKINTOWN, PENNSYLVANIA

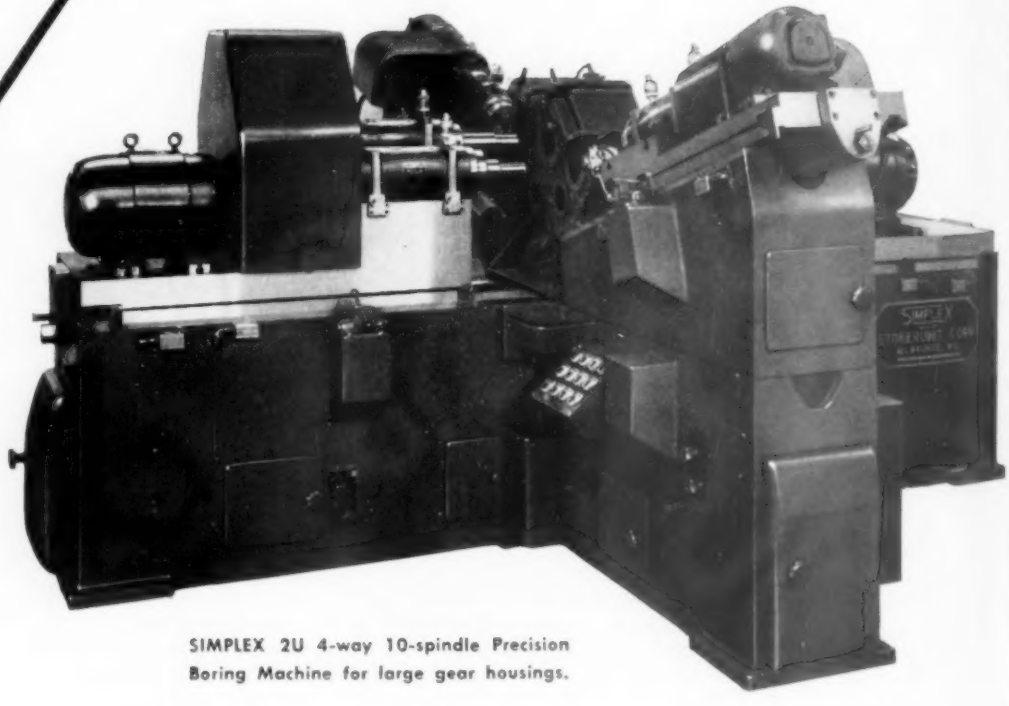
"UNBRAKO Counts With The Men Who Count"

SIMPLEX



SIMPLEX 1L1 Precision Boring Machine for small parts and high production.

We build 25 sizes and types of SIMPLEX Precision Boring Machines, suitable for handling the entire range of precision boring work. Give us an opportunity to study your needs and recommend our equipment.



SIMPLEX 2U 4-way 10-spindle Precision Boring Machine for large gear housings.

Precision Boring Machines

STOKERUNIT CORPORATION

SIMPLEX Precision Boring Machines and Planer Type Milling Machines

4528 West Mitchell Street, Milwaukee 14, Wisconsin

Index of Tool Engineer Advertisers

JANUARY, 1950

The Tool Engineer Index

EDITORIAL CONTENTS

VOLUMES XXII and XXIII

January through December, 1949

*TED—Tool Engineering Data sheets

E

F

G

H

Q

R

S

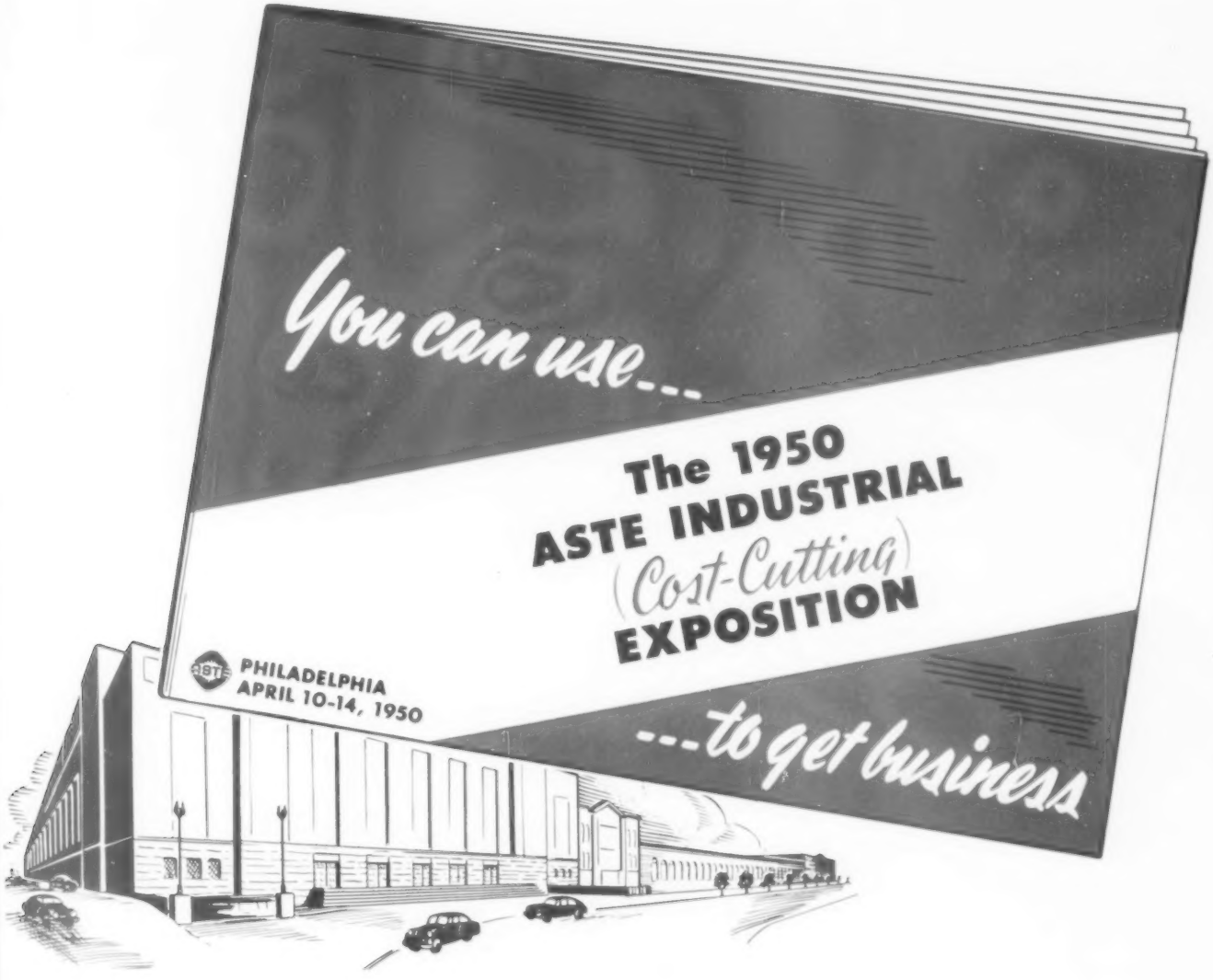
T

U

V

W

Z



If you make or sell anything that can cut production costs . . .

If your sales organization can use the help of the American Society of Tool Engineers in BRINGING YOUR PROSPECTS TO YOU . . .

Write, wire, or phone for this booklet.

The ASTE can help you for the simple reason, first of all, that its 18,000 members comprise those men **whose job it is to find new methods and equipment that will cut their companies' costs.**

That's what a tool engineer is.

Write, wire or phone for this booklet today. It is not too early to plan right now for those 5 vitally important dates on your 1950 sales calendar.

Who are these tool engineers? A breakdown of registrations at the last ASTE Exposition shows that they hold the following positions in their companies:

President, Owner or Partner.....	13½%
Top Management Executives.....	17 %
Production Executives.....	25 %
Master Mechanics; Process, Methods & Production Engineers, Etc.....	26 %
Chief Engineers, Development Engineers, Etc.....	18½%
TOOL ENGINEERS.....	**100%**

The booklet will tell you how many thousands of each there were . . . what kind of companies they represented . . . where they came from . . . what kind of products they came to see and buy.

And it tells you why EVEN MORE OF THE MEN WHO SPECIFY AND BUY will be at Philadelphia's Convention Hall & Commercial Museum next April 10th to 14th, looking for things that will cut their costs.

AMERICAN SOCIETY OF TOOL ENGINEERS

EXPOSITION COMMITTEE

10700 PURITAN AVENUE • DETROIT 21, MICHIGAN • UNIVERSITY 4-7300

why it pays to have these WALES HOLE PUNCHING & NOTCHING CATALOGS *at your finger tips*

● Before deciding on the hole punching and notching portion of your tooling program, check into Wales Catalogs where your particular problem may be solved by using STANDARD adaptations of STANDARD Wales Equipment. Join the thousands of manufacturers who have made it a rule to refer to Wales Catalogs before putting holes in sheets, angles and channels by ANY method.

Wales functionally-colored catalogs fully illustrate and describe the unlimited stamping press and press brake set-ups that are made possible by this Wales Equipment *that has revolutionized tooling.*

Remember, there's always something new in the Wales line so keep posted.

WRITE TODAY

for Wales Catalogs to have them at your finger tips. Wales Equipment pays off fast.

WALES-STRIPPIT CORPORATION

GEORGE F. WALES, *Chairman*

393 PAYNE AVENUE, NORTH TONAWANDA, N. Y.

(Between Buffalo and Niagara Falls)

WALES-STRIPPIT OF CANADA, LTD., HAMILTON, ONTARIO

Specialists in Punching and Notching Equipment


LOG
PUNCHING